Armed Forces College of Medicine

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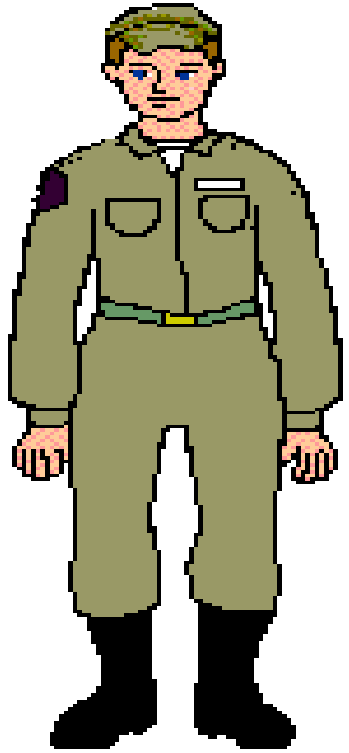


Movements of Joints of Upper Limb

By

Prof Azza Kamal

Intended Learning Outcomes

- **By the end of this lecture, each student should be able to:**

1. **List movements of shoulder girdle, shoulder joint, elbow, radioulnar, wrist & hand joints.**
2. **Predict muscles producing the movements of the above mentioned joints.**
3. **Describe clinical applications of movements of joints of the upper limb.**

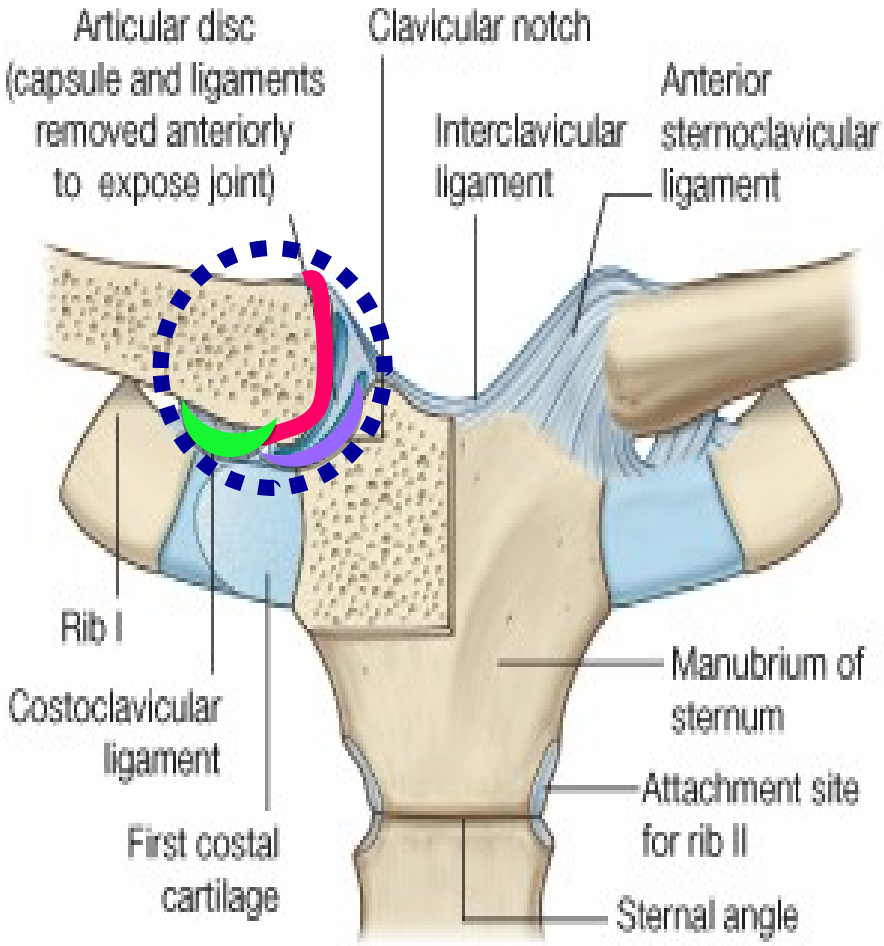
KEY POINTS OF THE LECTURE

1. Movements of different joints of the upper limb
2. Muscles producing these movements
3. Relevant applied anatomy

Sternoclavicular joint

- **Type:**
- **Synovial, Saddle joint**

- **Articulating surfaces:**
- **Medial end of clavicle**
- **With clavicular notch of sternum & adjacent part of upper surface of 1st costal cartilage**



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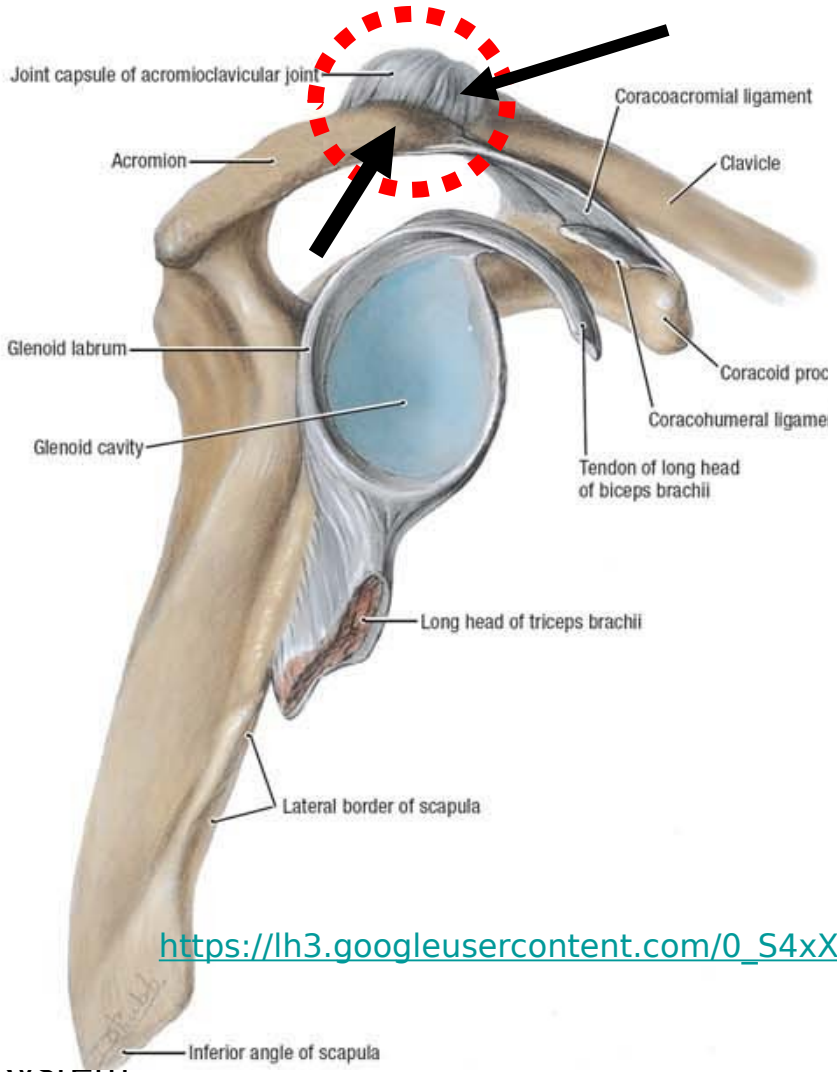
Acromioclavicular joint

- **Type:**
- **Plane synovial joint**
- **Articulating surfaces:**
- **Facet on medial surface of acromion process of scapula with acromial end of clavicle**



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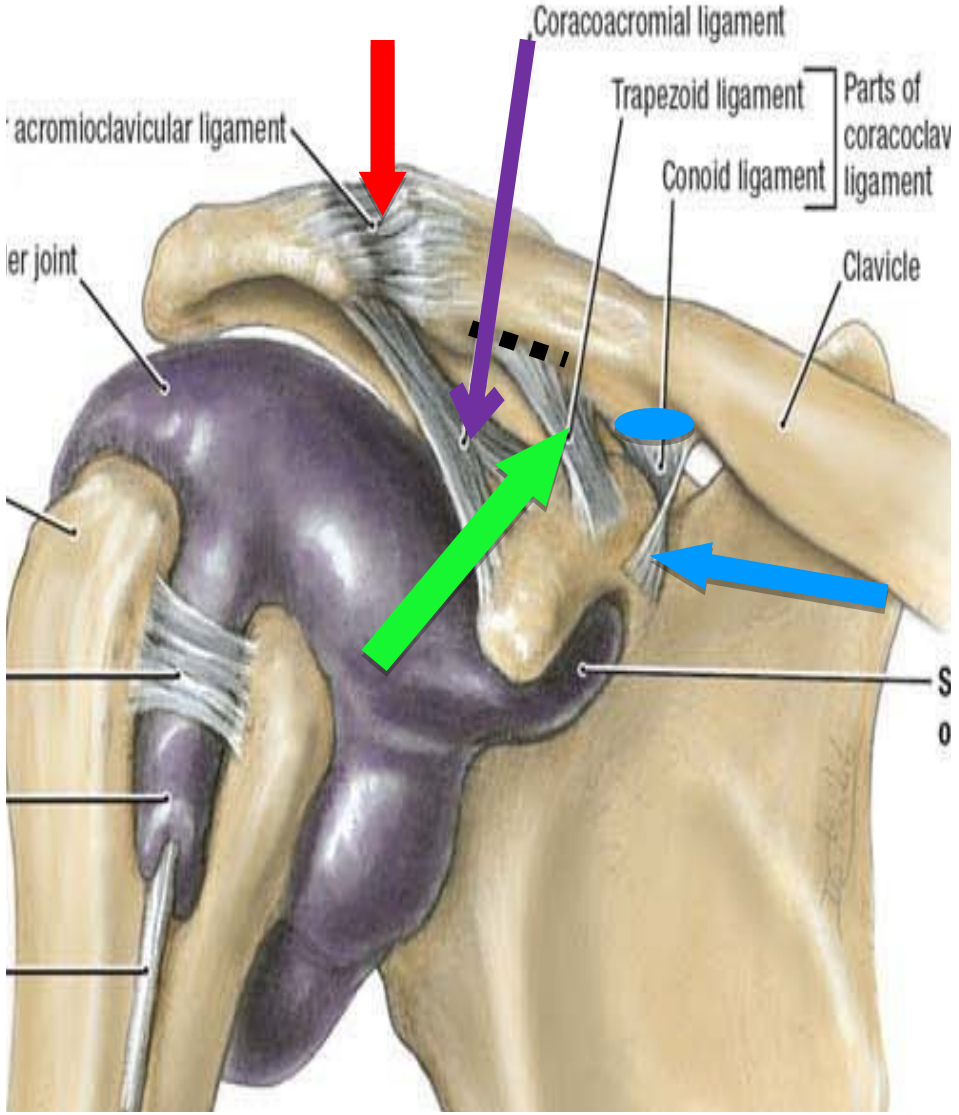
- **Ligaments of acromioclavicular joint:**

1. **Small acromioclavicular ligament**
2. **Large & strong coracoclavicular ligament formed of 2 parts:**

a) **Trapezoid part attached to trapezoid line of clavicle**

b) **Conoid part attached to**



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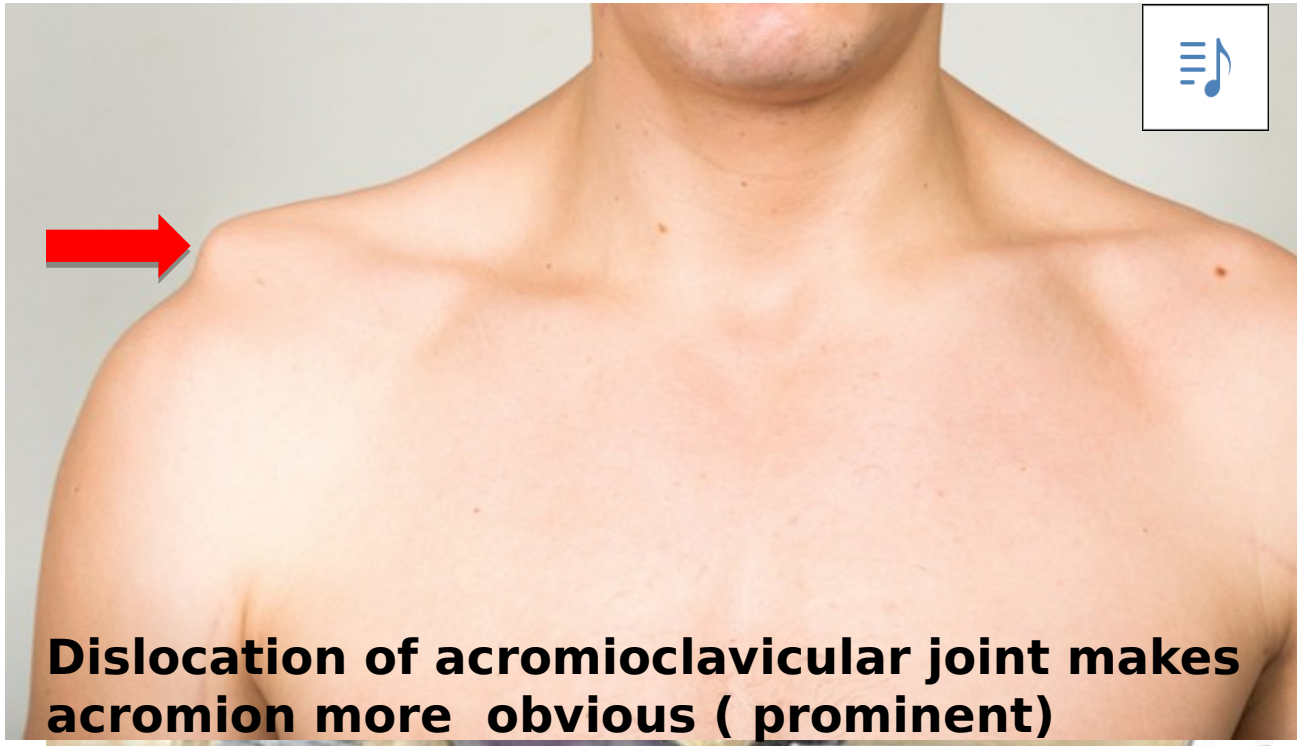
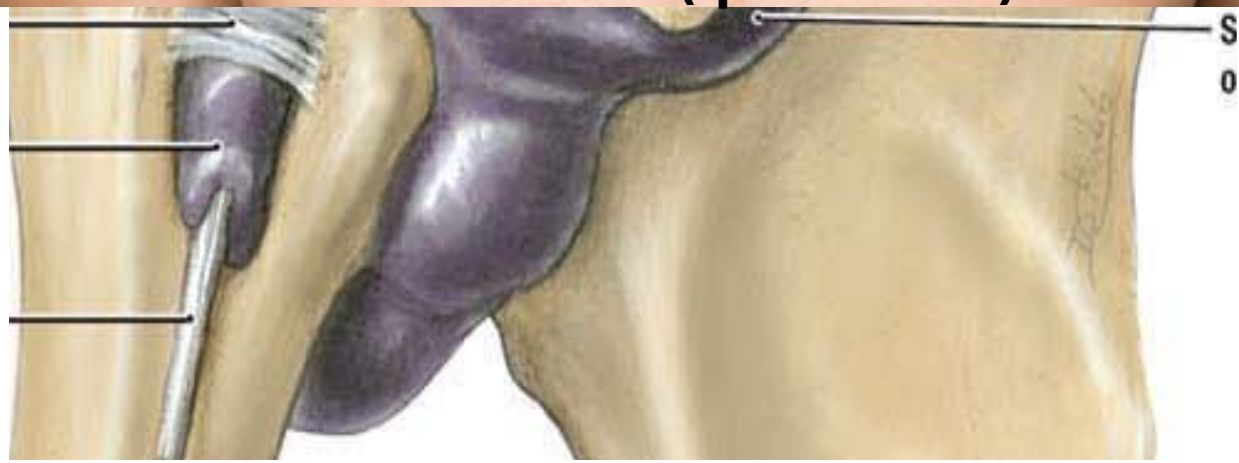
- **The strength of acromioclavicular joint depends on the very strong . coracoclavicular ligament**

- **The greater part of the weight of the Upper Limb is transmitted to the clavicle through coracoclavicular ligament.**



Dislocation of acromioclavicular joint makes acromion more obvious (prominent)



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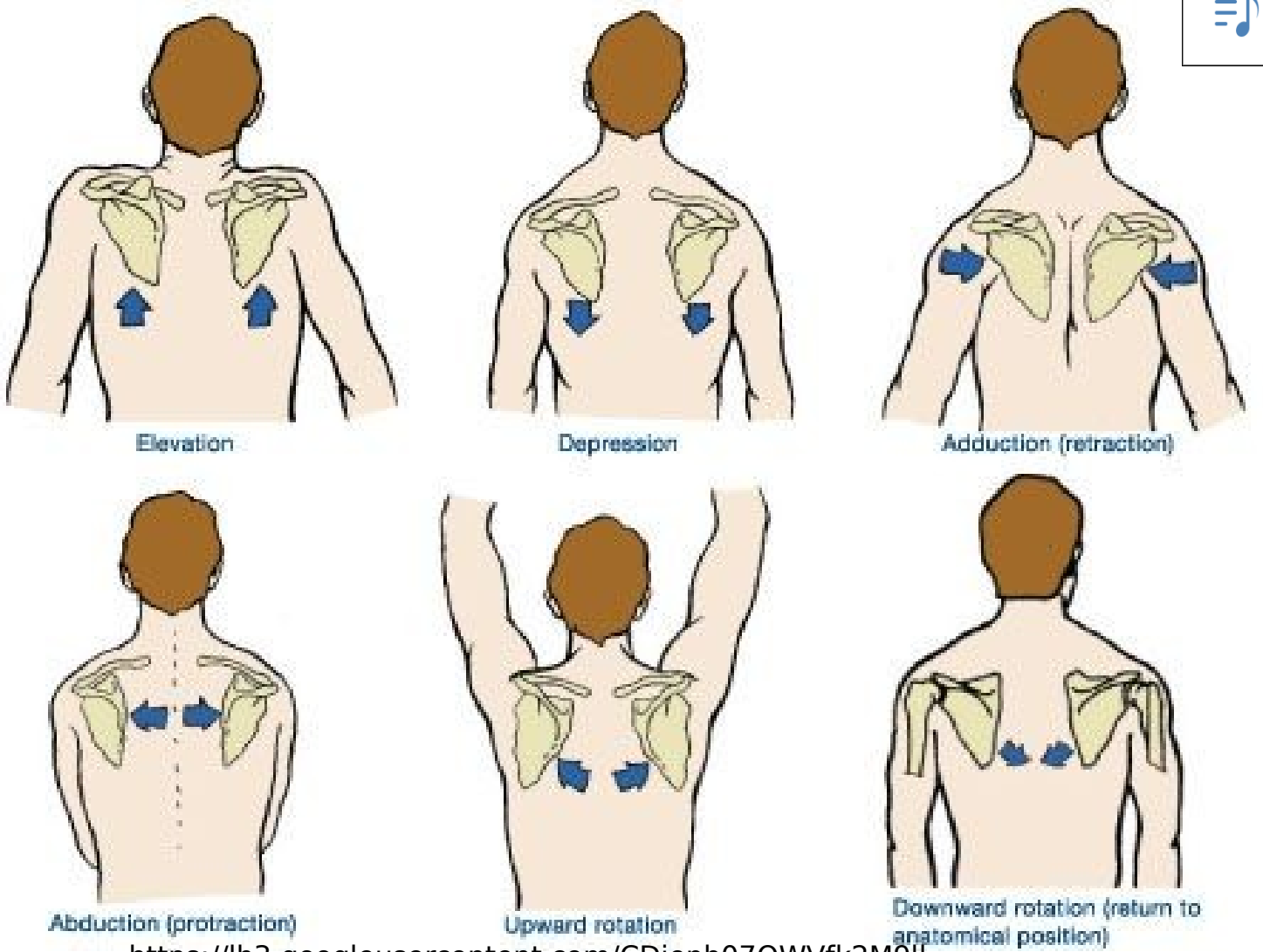
: Clinical Note

A hard fall on the shoulder as during playing football, soccer or hockey could result in rupture of coracoclavicular ligament shoulder falls away from clavicle owing to the weight of the UL

Movements of the shoulder Girdle

- **Movements of the clavicle at the sternoclavicular and acromioclavicular joints are always associated with**



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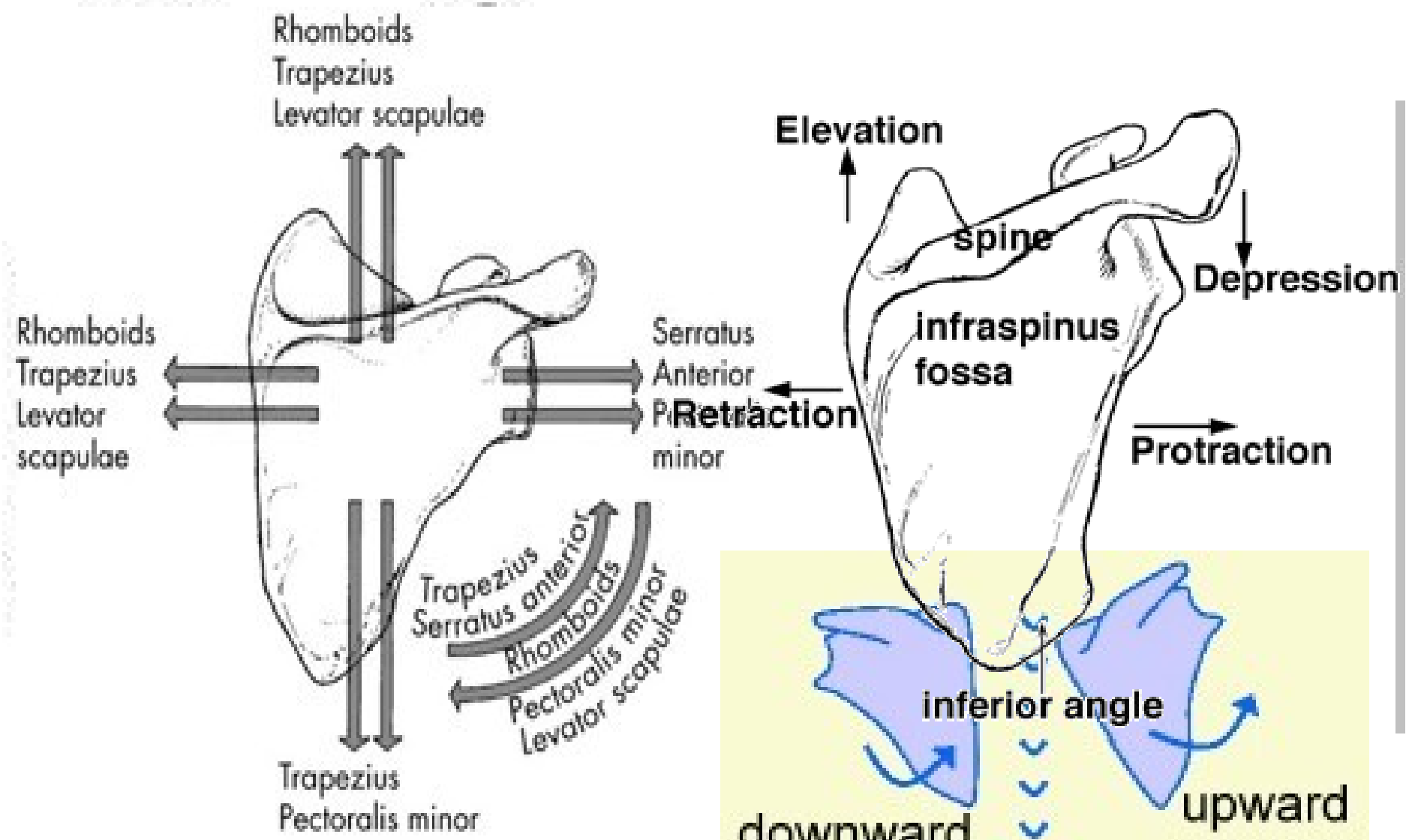
Scapular movements include

1. **Elevation** upper fibers of trapezius & levator scapulae
2. **Depression** pectoralis minor & lower digitations of serratus anterior + gravity
3. **Protraction** pectoralis minor & serratus anterior
4. **Retraction** trapezius & rhomboids
5. **Rotation up** as when you raise the arm above the head by upper fibers of trapezius & lower digitations of serratus anterior
6. **Rotation down** gravity + levator scapulae, rhomboids & pectoralis minor

❖ **Subclavius steadies the clavicle during movements of shoulder girdle**



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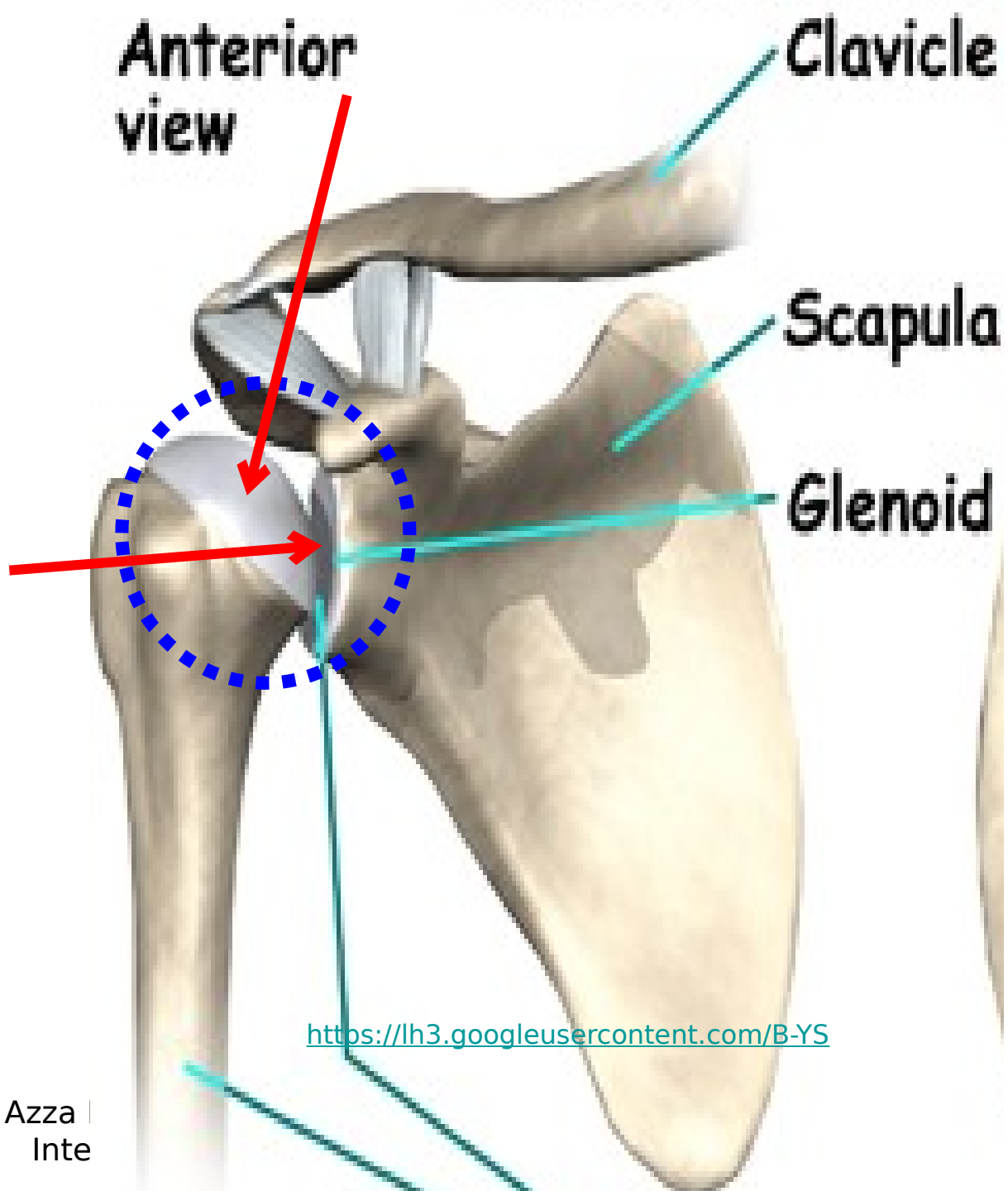
SHOULDER JOINT

- **Type:**
  - **Ball & socket synovial joint**
  - **Multiaxial**
  - **Most mobile joint in the body**

- **ARTICULAR SURFACES:**
  - **Head of humerus & glenoid cavity of scapula**



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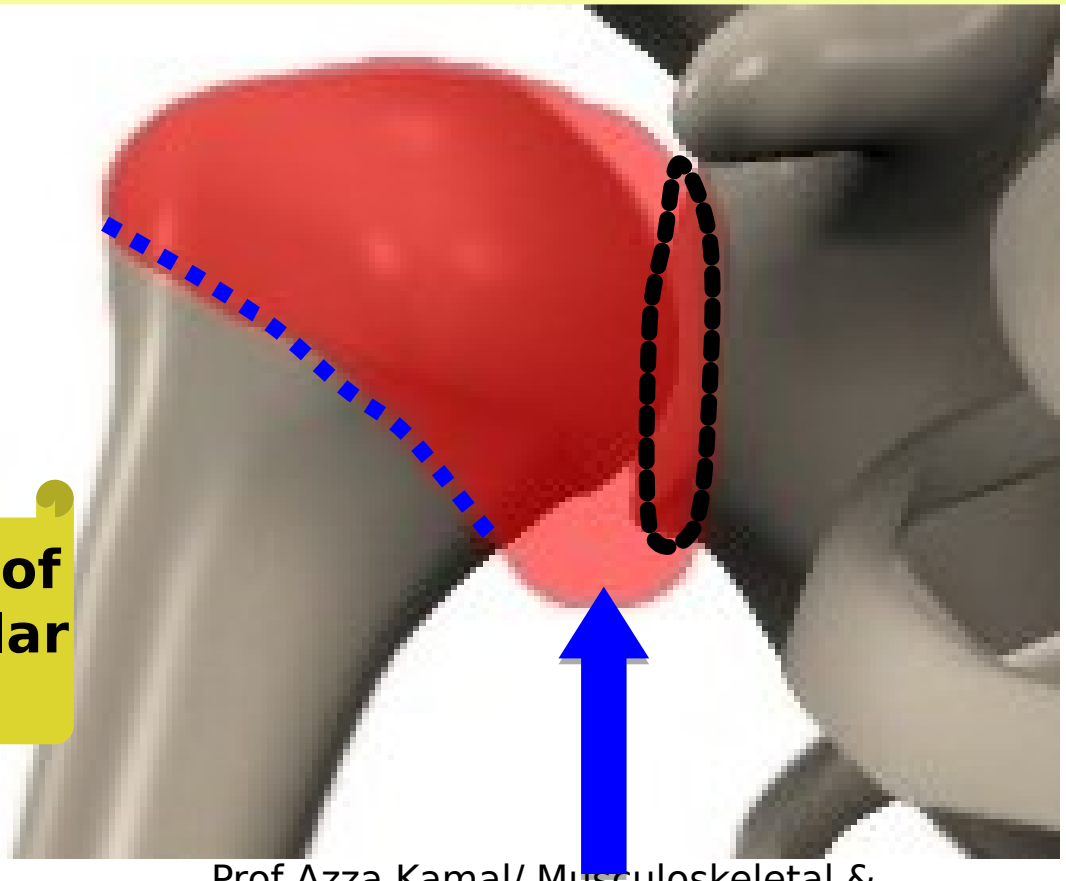
Applied anatomy:

Anteroinferior part of capsule of shoulder joint is the thinnest & least upported specially during abduction where dislocation of shoulder join frequently occurs. Axillary nerve which passes round the surgical neck of humerus is liable to injury in this position.



Note the attachment of capsule to the articular margin

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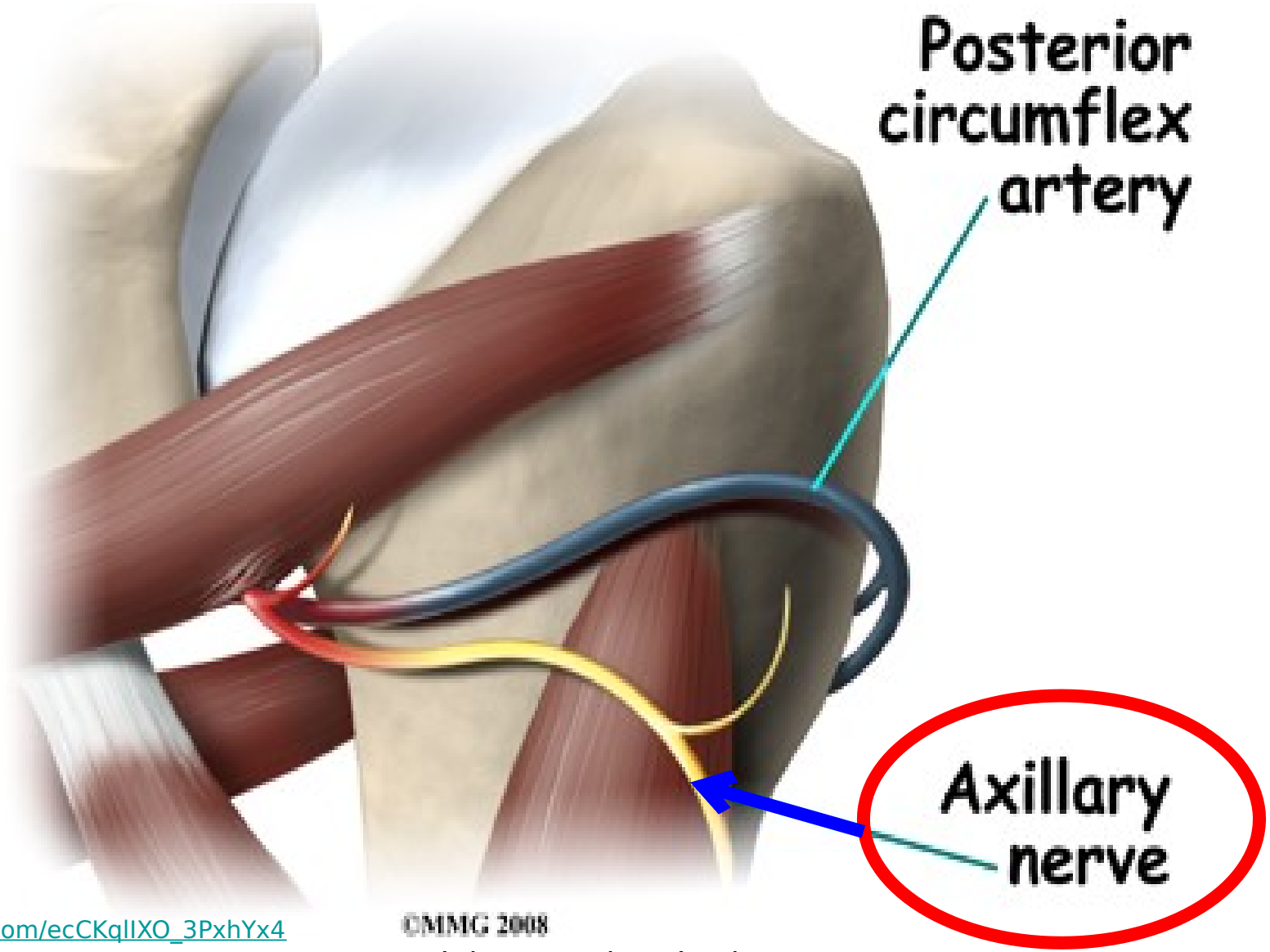

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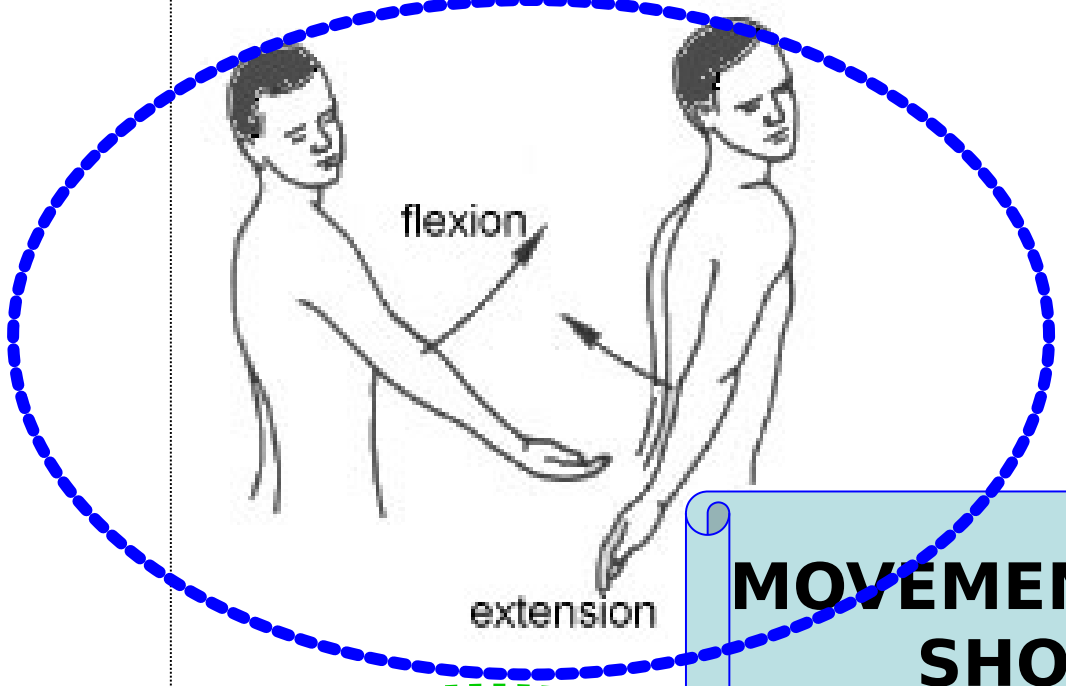
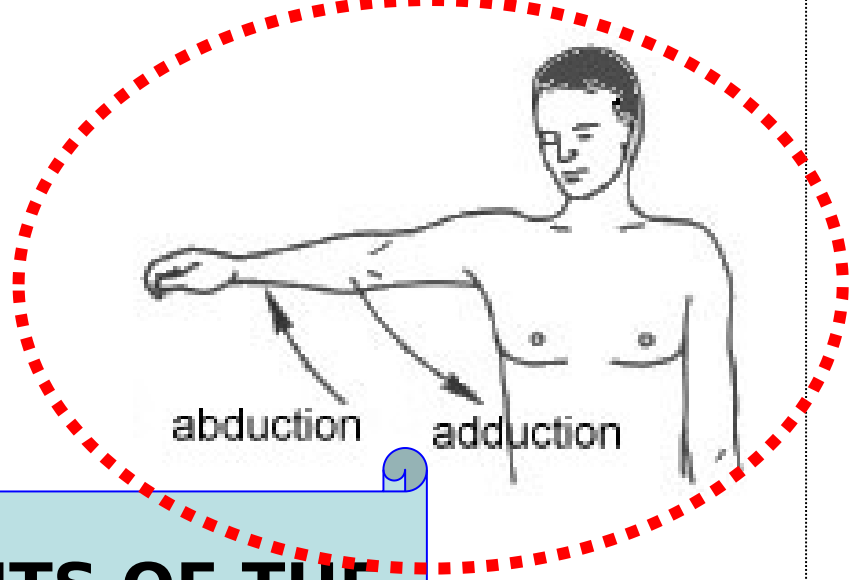
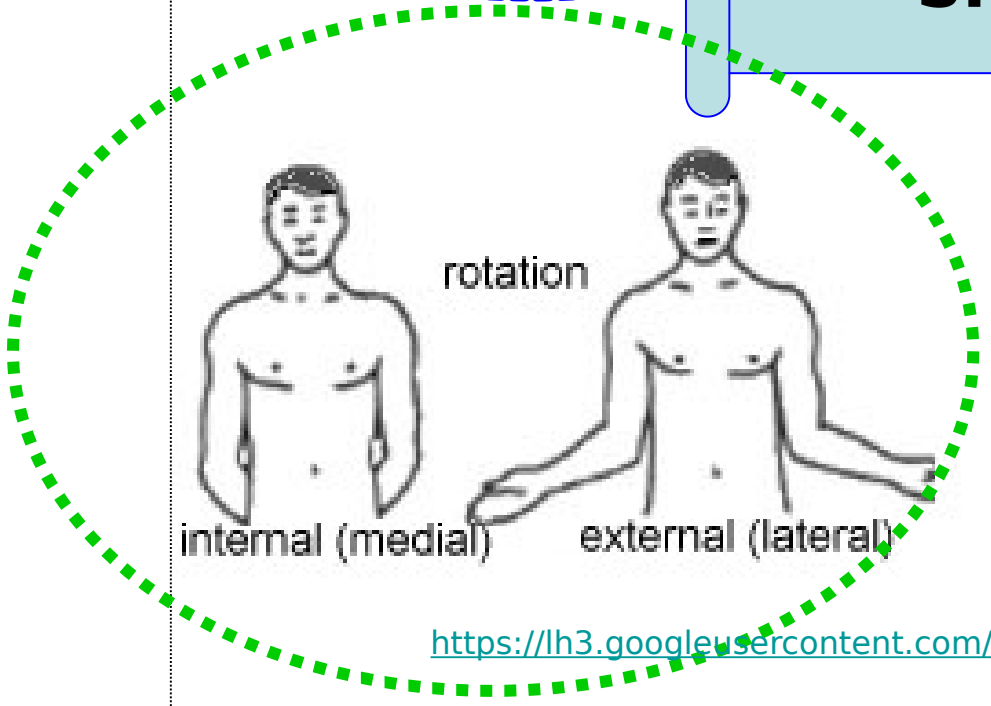
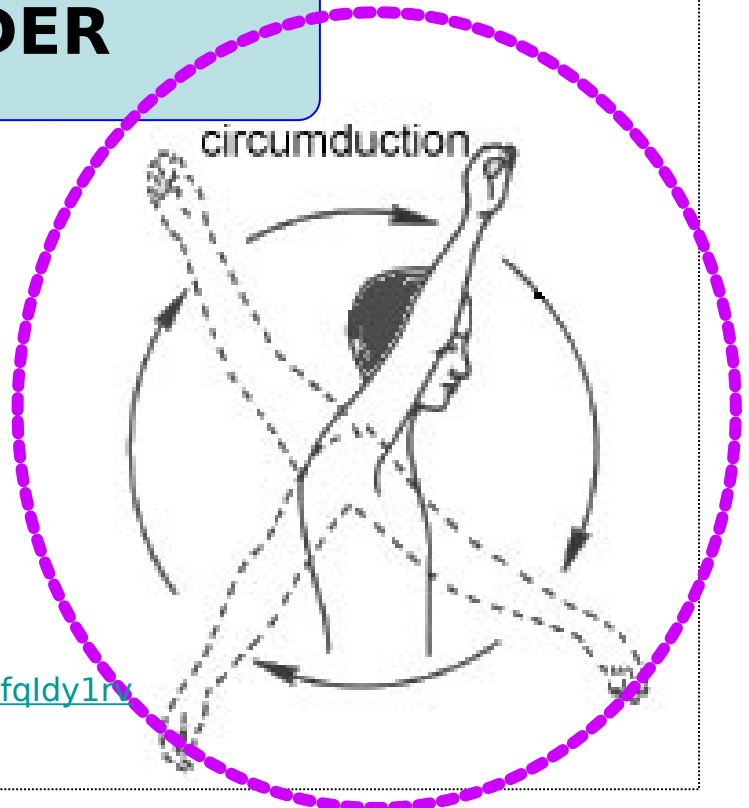
MOVEMENTS OF THE SHOULDER









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Movements of shoulder joint

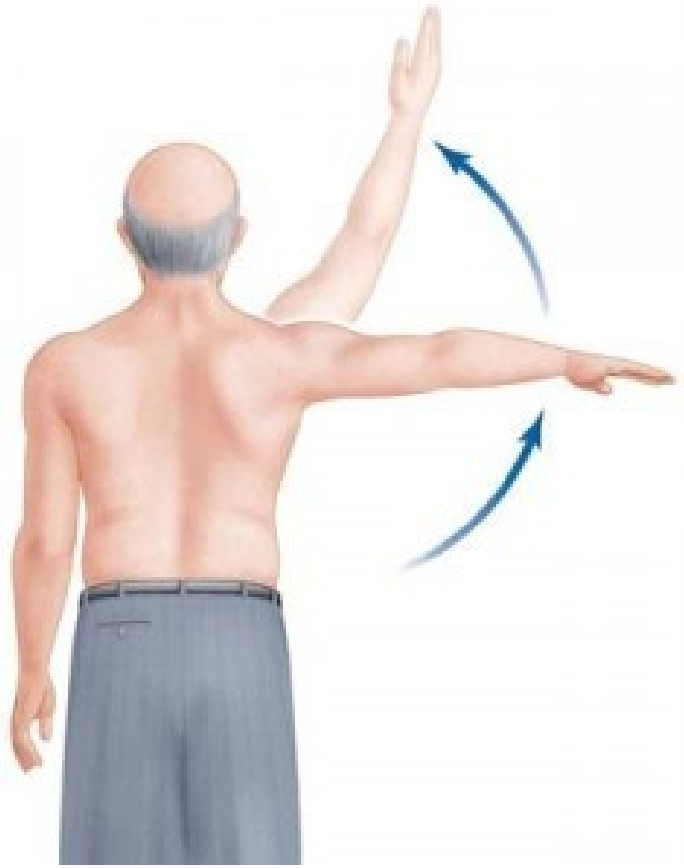
- **Flexion:** by muscles **anterior** to the joint like **pectoralis major, coracobrachialis** and **anterior fibers of deltoid**.
- **Extension:** by muscles **posterior** to the joint like **latissimus dorsi, teres major** and **posterior fibers of deltoid.**
- **Abduction:** by muscles **superior** to the joint. Movement is **initiated** by **supraspinatus** then **completed** by **deltoid.**

Abduction of the arm:

Supraspinatus 0° – 15°, at shoulder joint.

Deltoid (middle fibers) 15° – 90°, at shoulder joint.

Trapezius & lower digitations of serratus anterior 90° – 180°, at shoulder girdle



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Adduction: by the two climbing muscles which are pectoralis major and latissimus dorsi.

Medial rotation: by muscles inserted into the bicipital groove which are pectoralis major, latissimus dorsi and teres major (major-lady-major) .

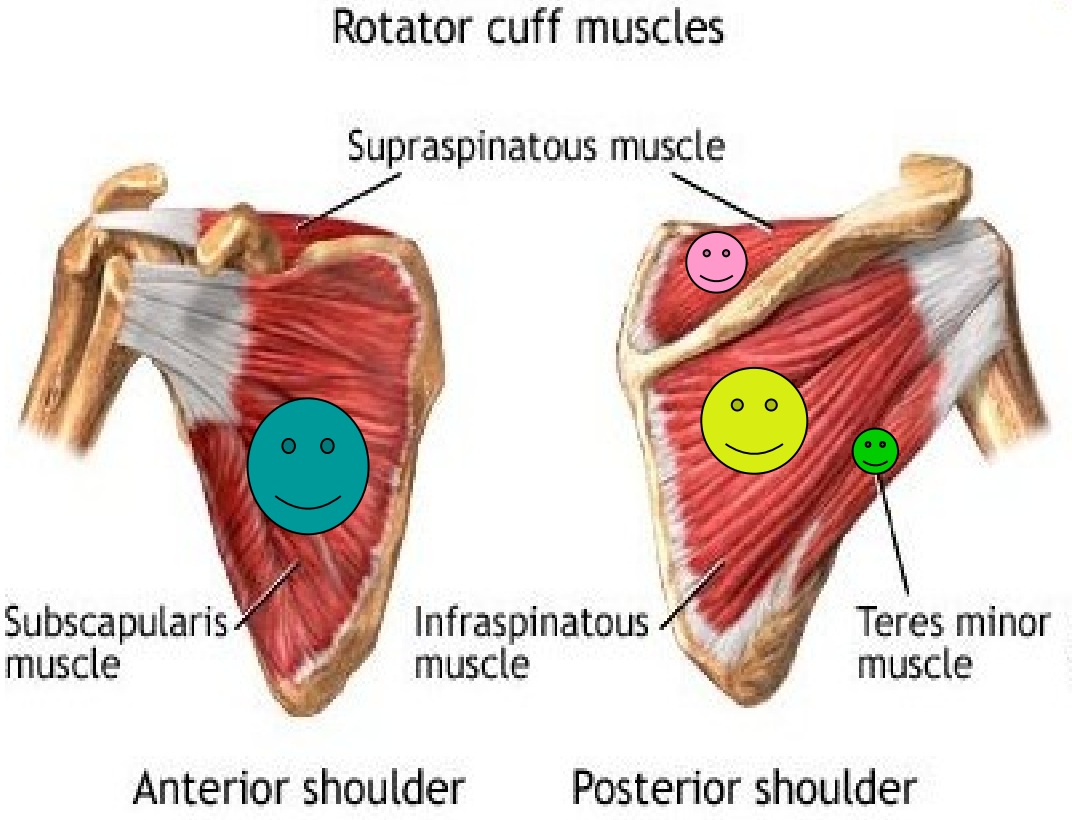
Lateral rotation: by muscles attached to the greater tuberosity which are

Stability of shoulder joint

- **Shoulder joint is a weak joint from the skeletal point of view.**
- **Its stability depends on the following (rotator cuff muscles/ coracoacromial arch/long heads of biceps & triceps)**

1. Rotator cuff muscles

supraspinatus/infraspinatus/teres minor& subscapularis , their tendons are adherent to capsule of shoulder joint to help keep head



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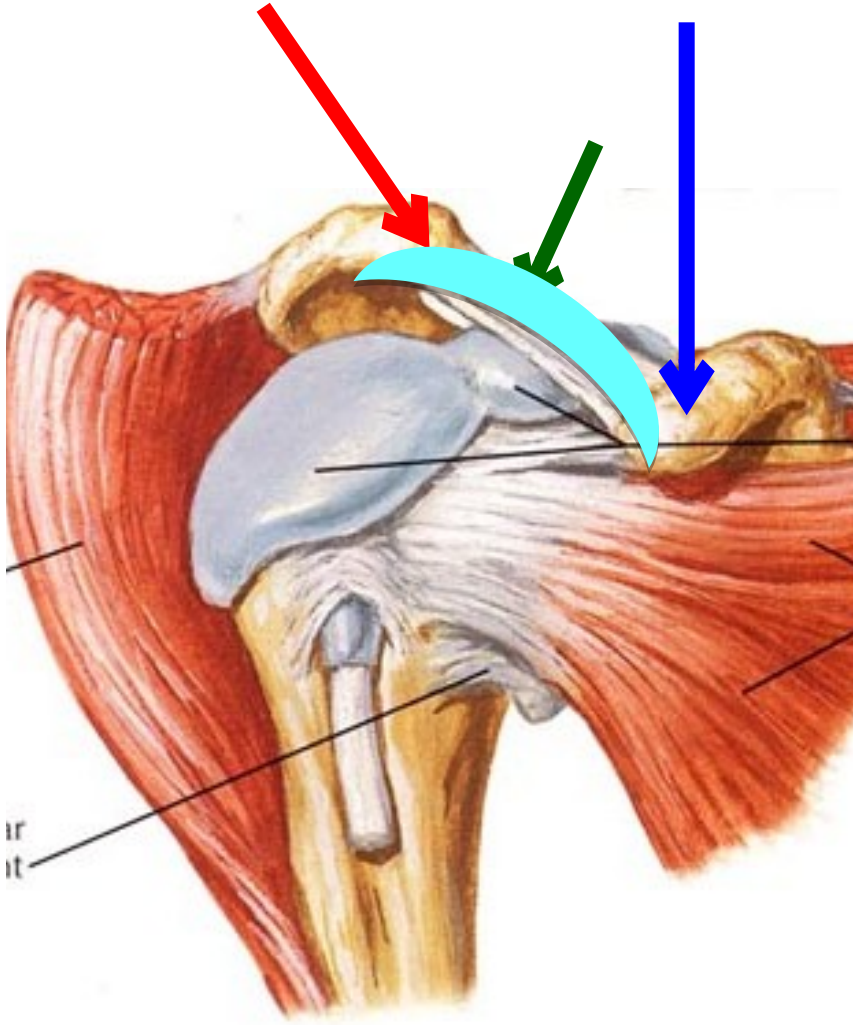
2. Coracoacromial arch:

Coracoid process, acromion process & coracoacromial ligament form an arch over head of humerus acting as a 2nd socket for head of humerus



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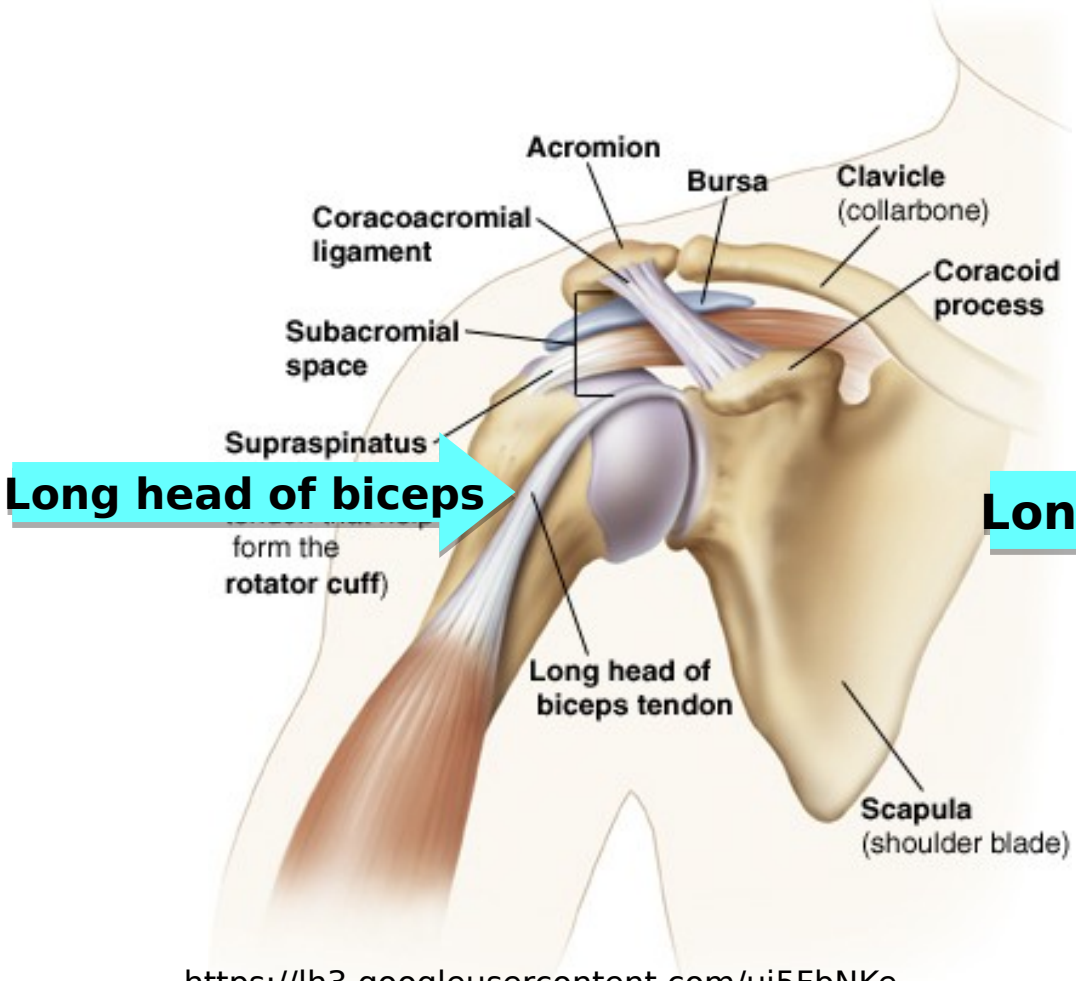
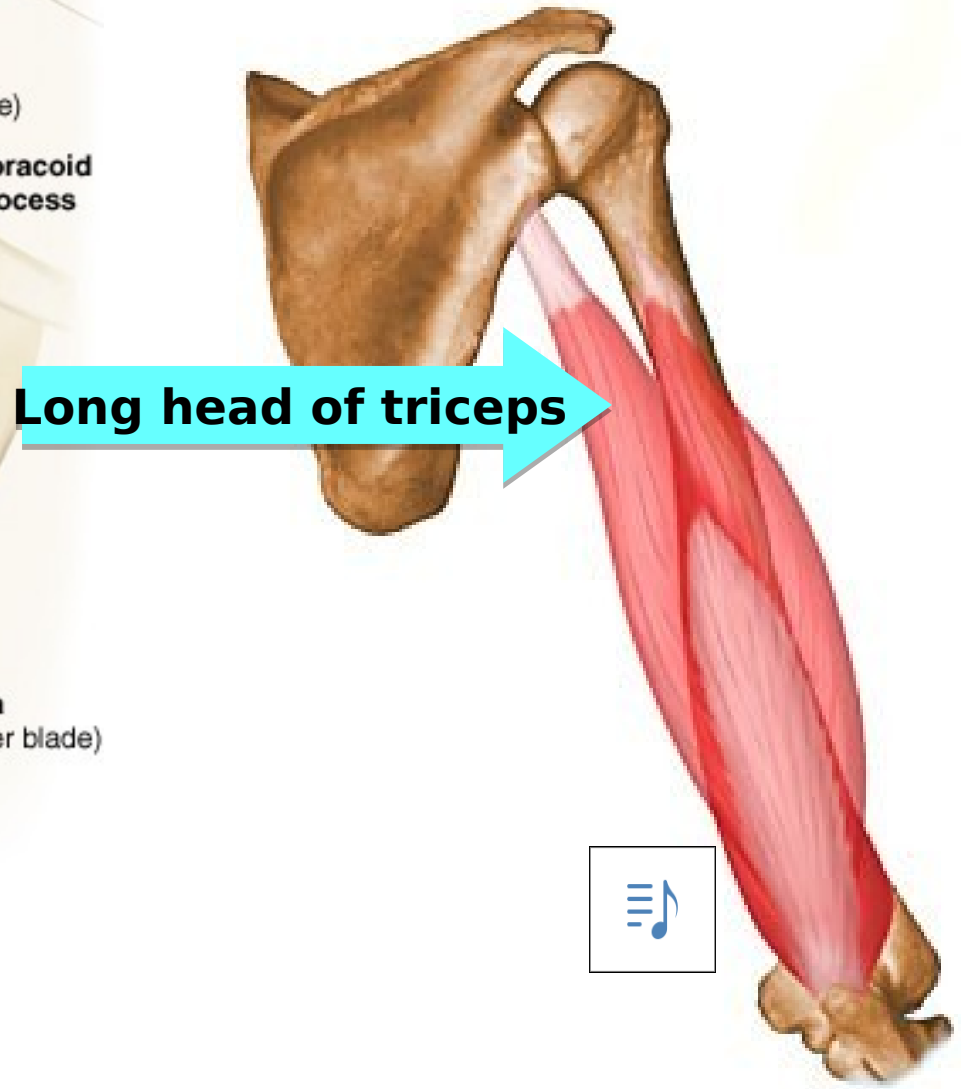
The long head of biceps muscle: Supports the humeral head from **above**.

The long head of triceps muscle: Supports the **abducted humerus** from **below** and **this**





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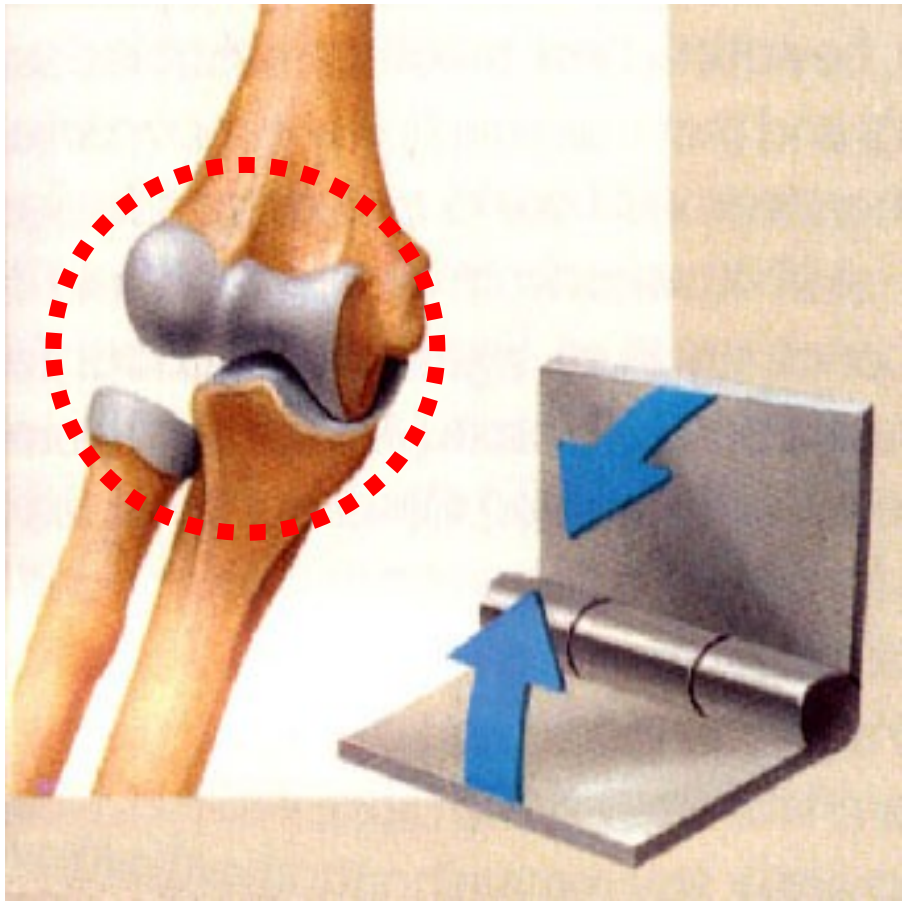
The Elbow Joint

- **Type:**
- **Hinge synovial joint**



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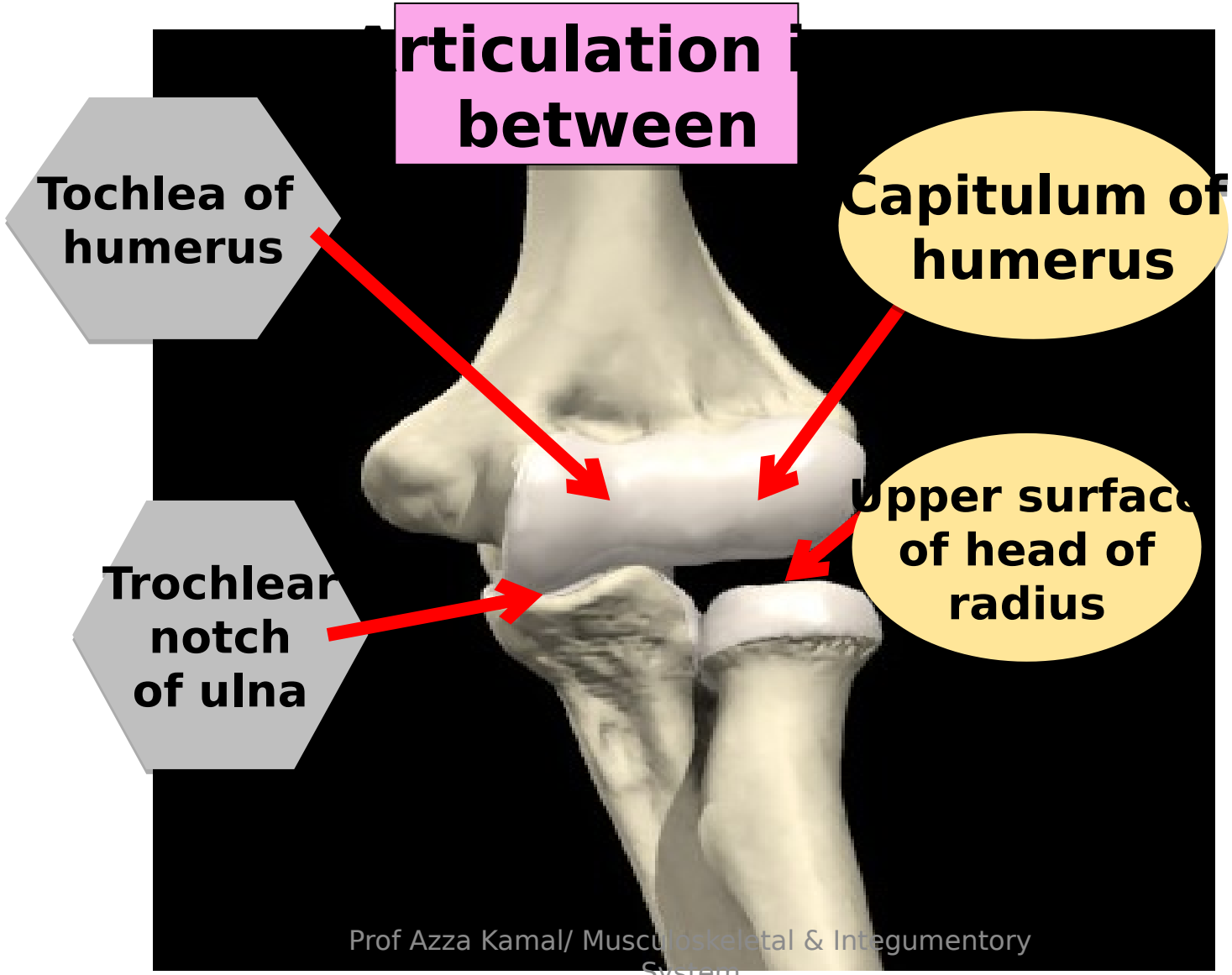

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Movements of elbow joint

- Uniaxial joint which permits only flexion & extension
- Flexion is carried by biceps, brachialis & brachioradialis
- Extension is carried by triceps & anconeus

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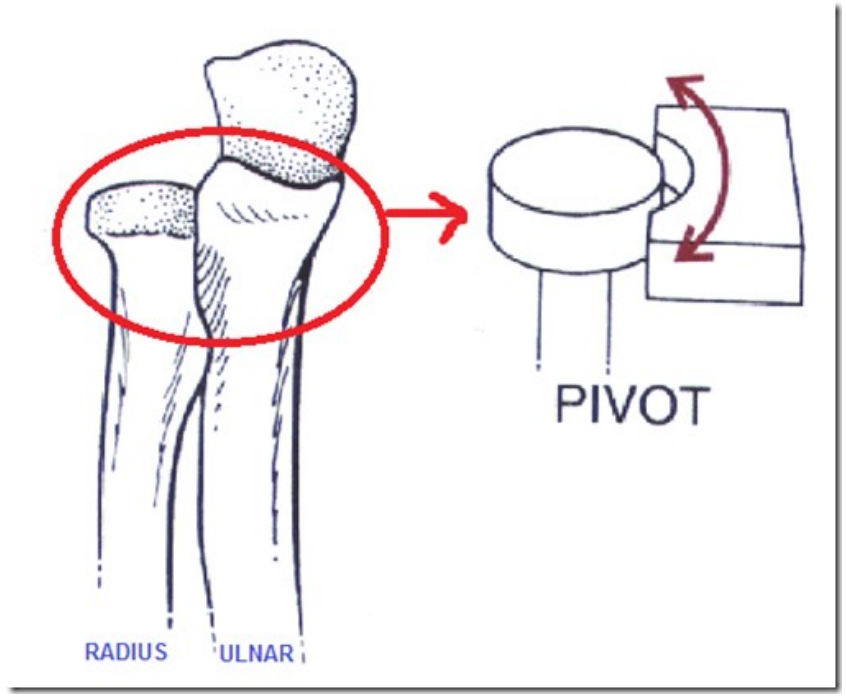
Superior radioulnar joint

- **Type :**

Pivot synovial joint



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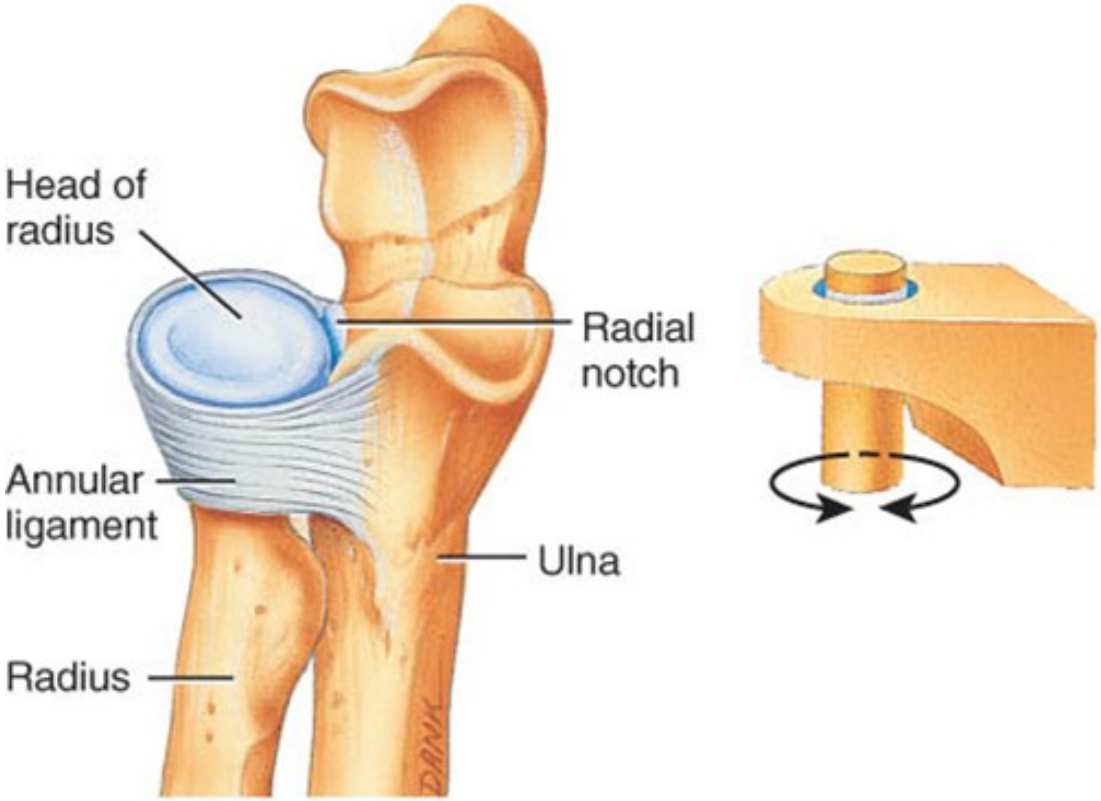

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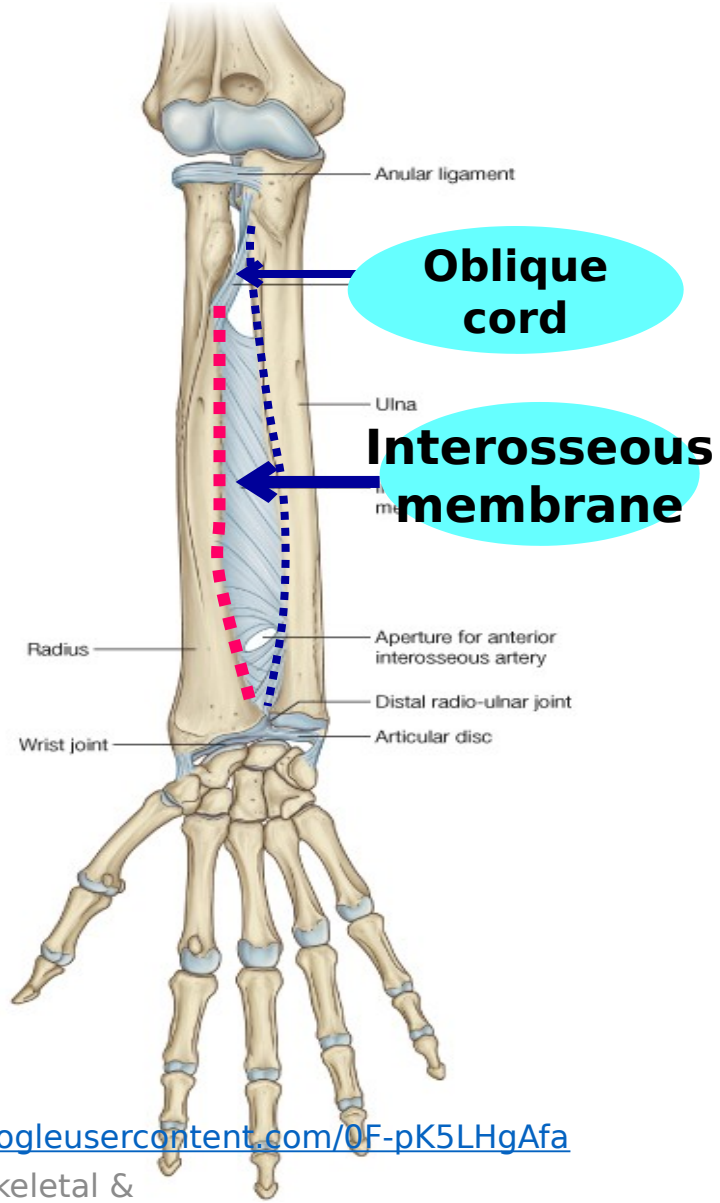
(c) Pivot joint between head of radius and radial notch of ulna

Middle radioulnar joint

- **Type: fibrous joint (syndesmosis)** between radius & ulna.

- Formed by oblique cord & interosseous membrane which connect the interosseous borders of radius & ulna



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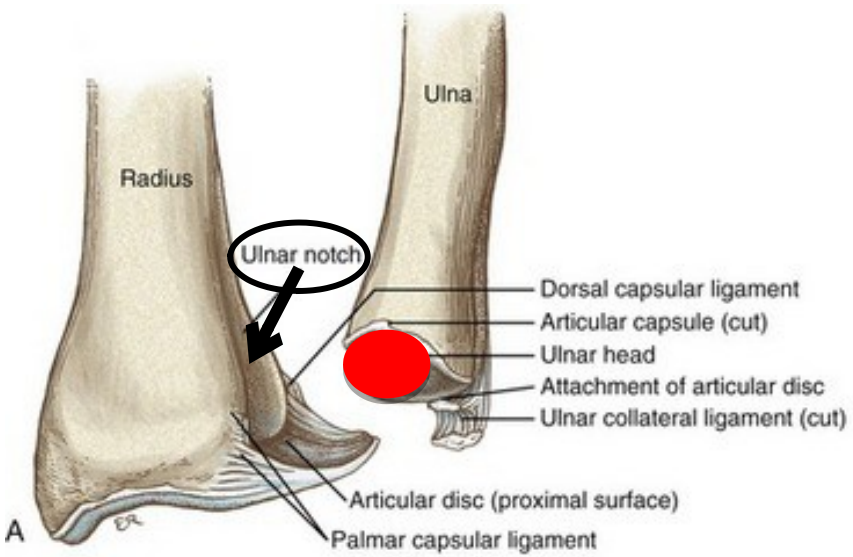
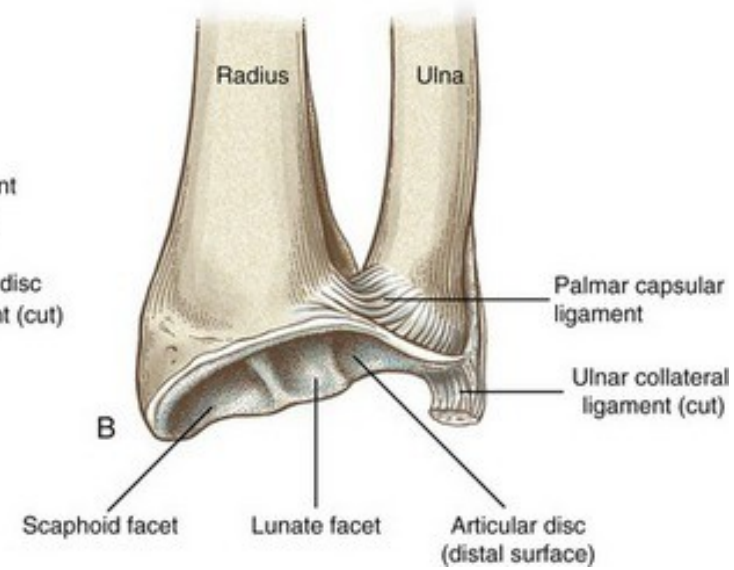
Inferior radioulnar joint

- **Type:** pivot synovial joint

- **Articulating surfaces:** head of ulna & ulnar notch of radius





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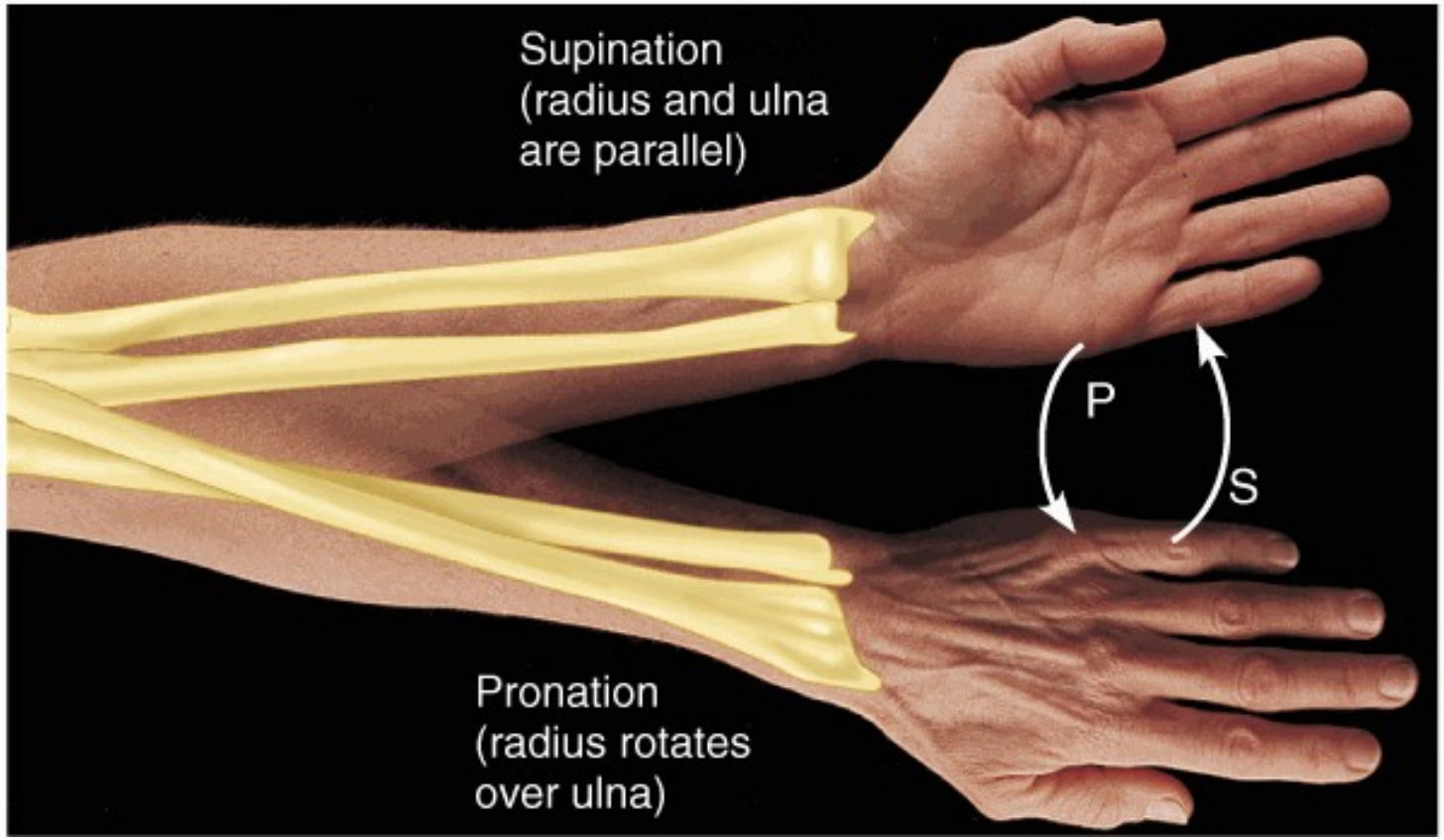
Movements of radioulnar joints

- **Pronation** → done by
  pronator teres &
  pronator quadratus
- **Supination** → done by

* Supinator in extended elbow
* Biceps in flexed elbow
* Brachioradialis initiates both pronation & supination



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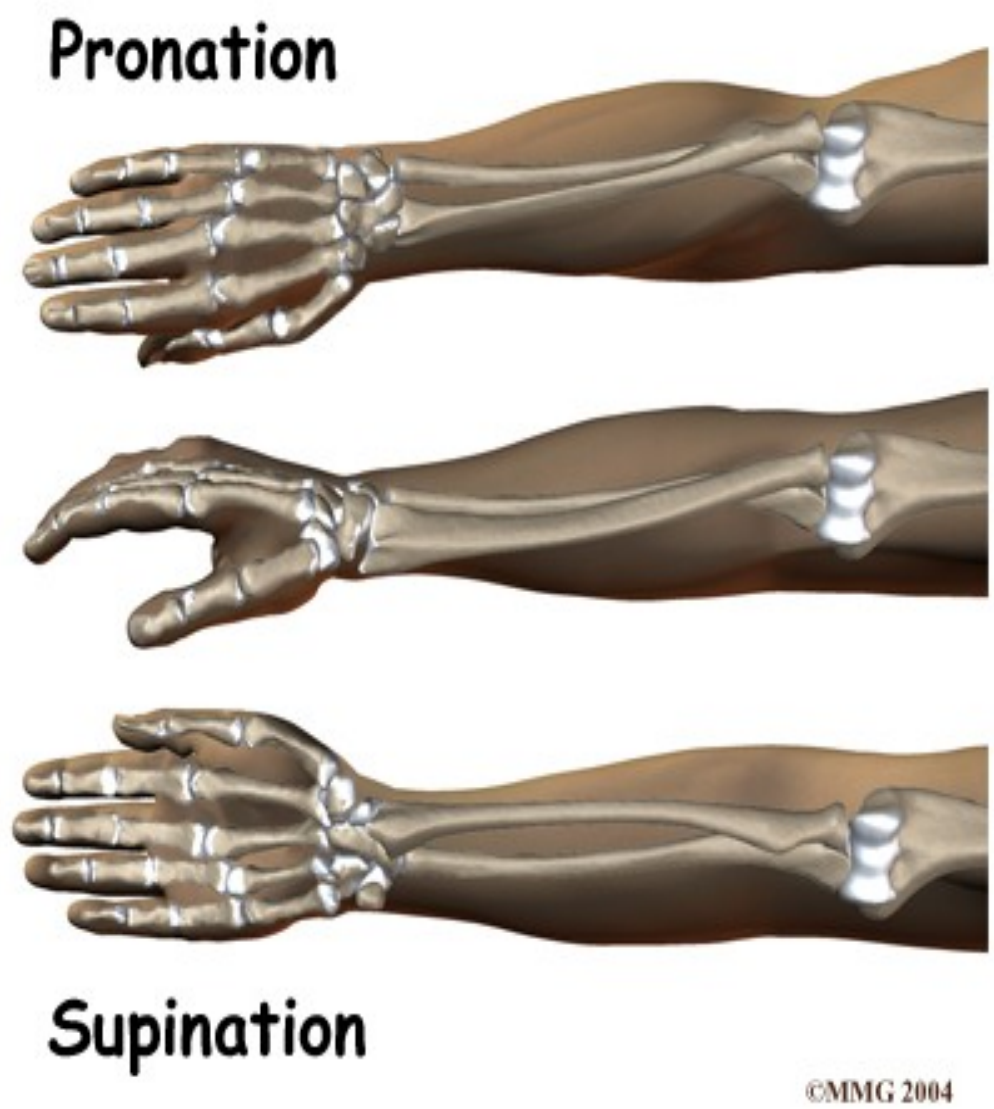
- During pronation & supination the radius is the movable bone while the ulna is relatively stationary.



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Pronation

During pronation Radius crosses the ulna like the letter X

Supination

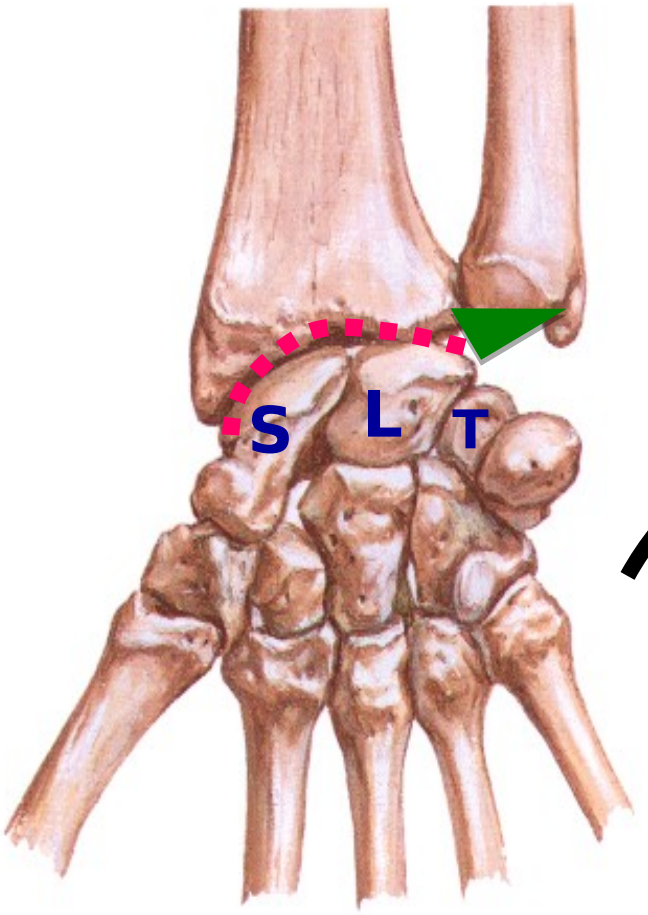
During supination Radius .goes back parallel to ulna

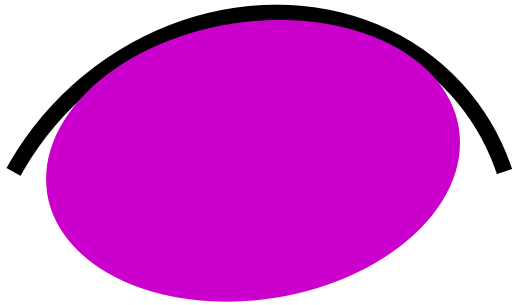
Frank H. Netter
Atlas of Human Anatomy
6th edition

The Wrist Joint

- Type : ellipsoid synovial joint
- Articulating surfaces:
- Superior inferior surface of distal end of radius & inf. surface of articular cartilage
- Inferior proximal surface of **s**caphoid, **l**unate & **t**riquetral bones

Radiocarpal joint





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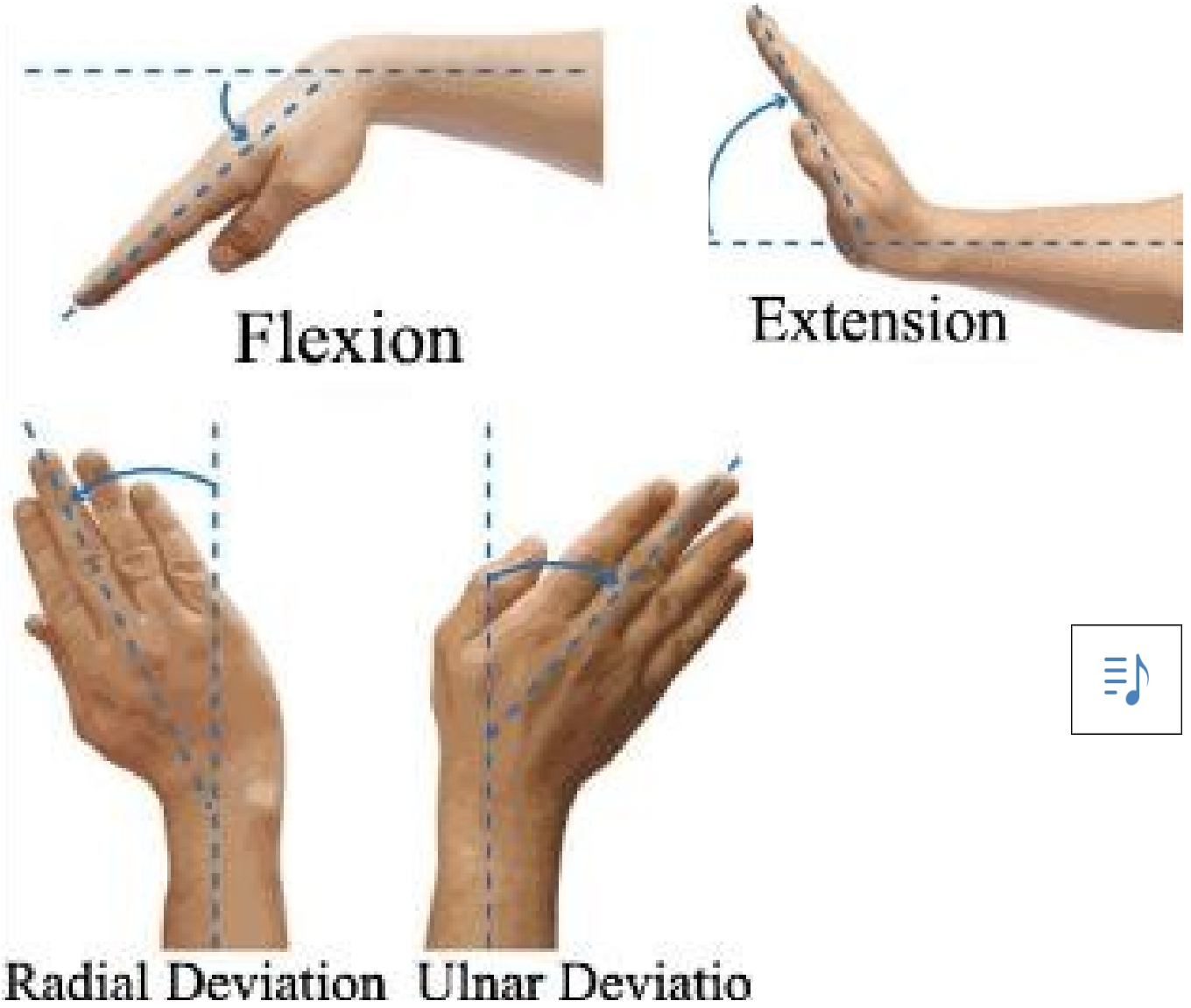
Movements of wrist joint

- Flexion by ?
- Extension by ?
- Abduction by ?
- Adduction by ?
- Circumduction ?



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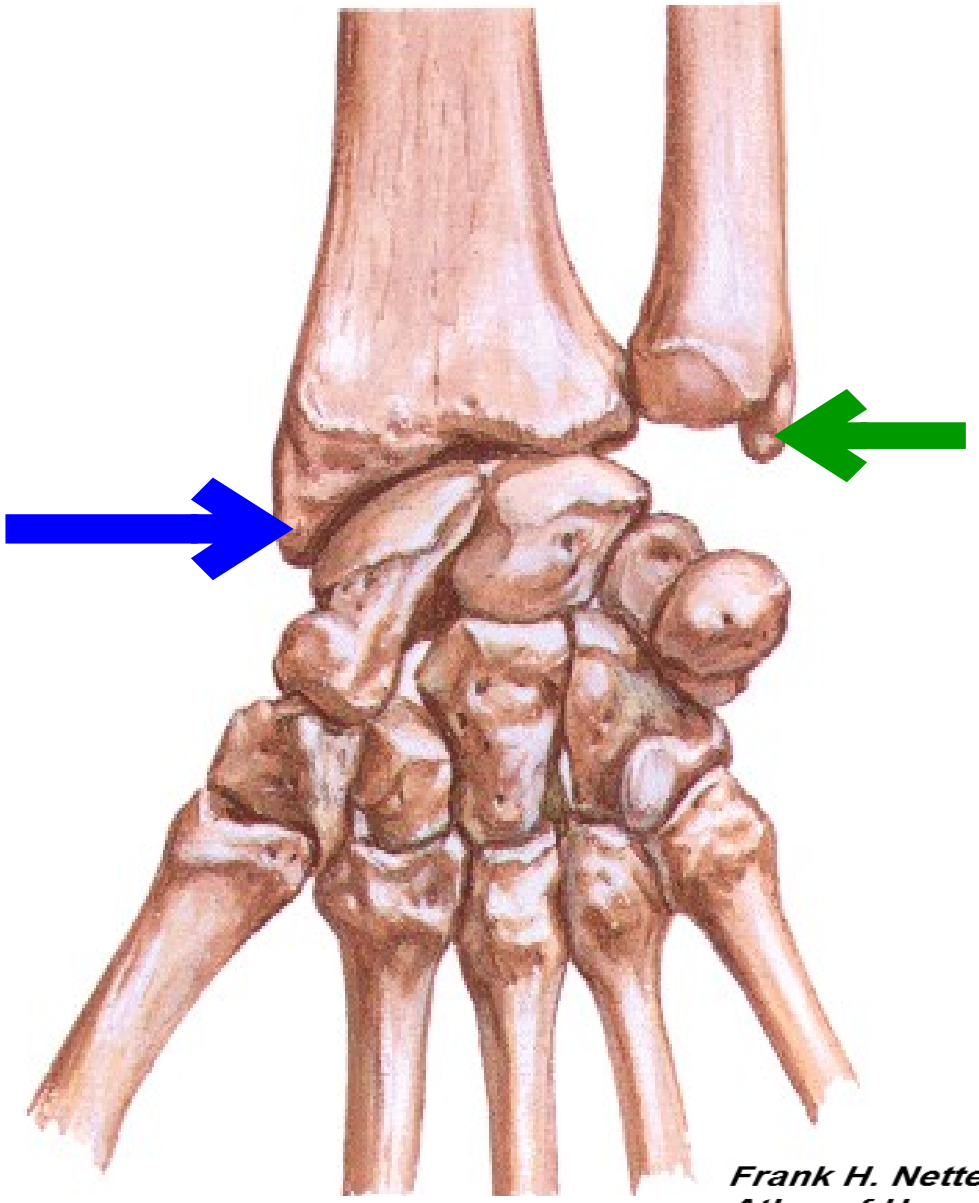
Movement	Muscle producing it
Flexion	Flexor carpi radialis, flexor carpi ulnaris, palmaris longus, flexor digitorum superficialis, flexor digitorum profundus, flexor pollicis longus
Extension	Extensor carpi radialis longus & brevis, extensor carpi ulnaris, extensor digitorum, extensor digiti minimi, extensor indicis & extensor pollicis longus
Adduction	Flexor carpi ulnaris & extensor carpi ulnaris
Abduction	Flexor carpi radialis & extensor carpi radialis longus & brevis
Circumduction	Combination of extension, abduction, flexion & adduction done in succession

- **Is the range of adduction of the hand at the wrist greater or lesser than the range of abduction and WHY???**

- **ADDUCTION IS GREATER THAN ABDUCTION**

- **Because the styloid process of radius is lower than the styloid process of ulna limiting abduction.**



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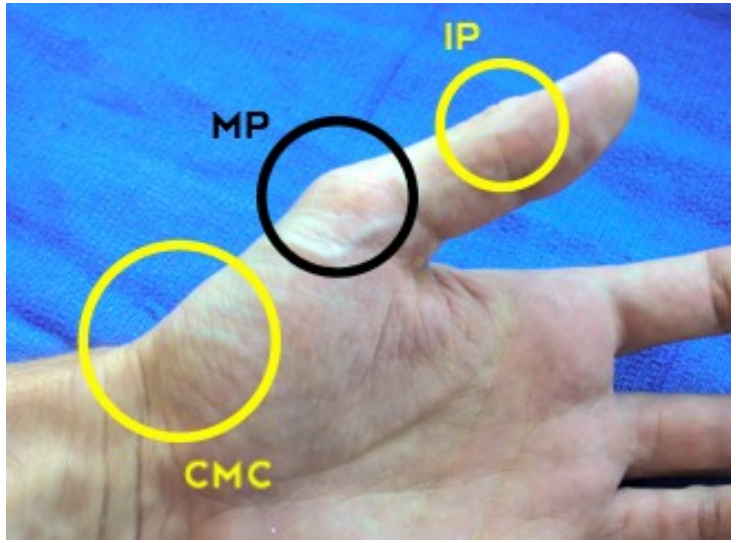
- **Intercarpal joints plane synovial**
- **Carpometacarpal joint of thumb synovial saddle between trapezium & base of 1st**



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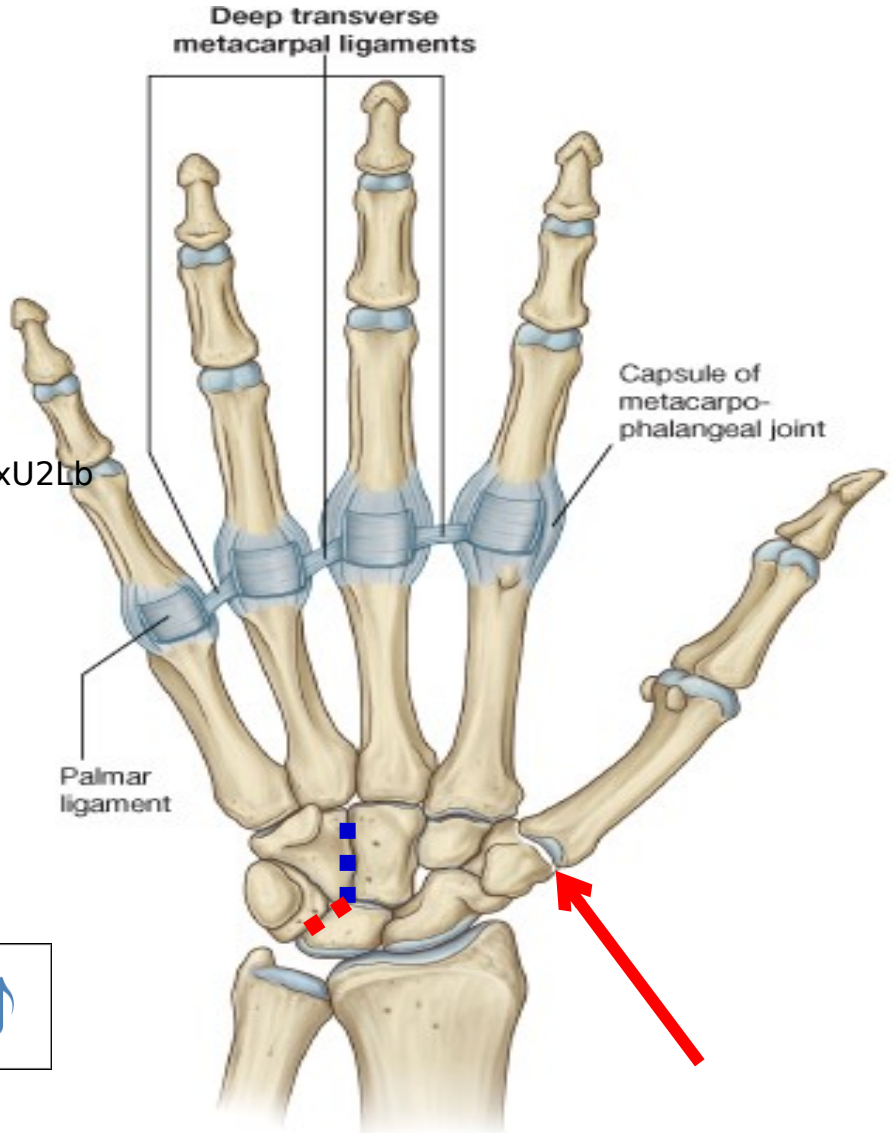

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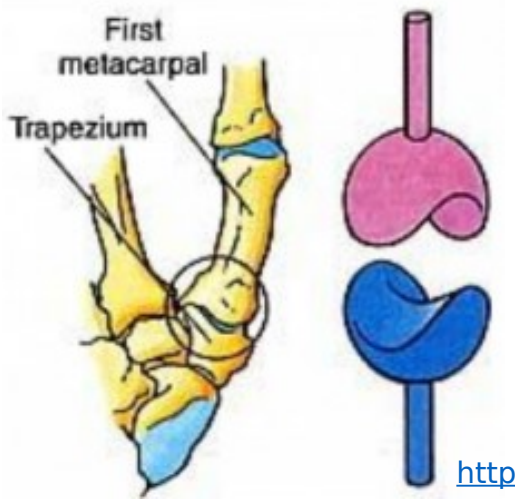

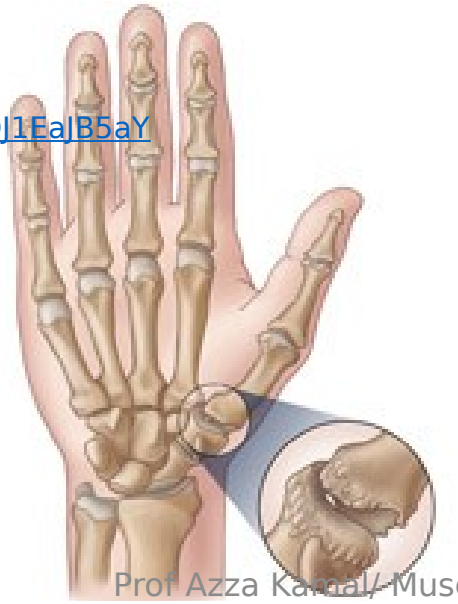

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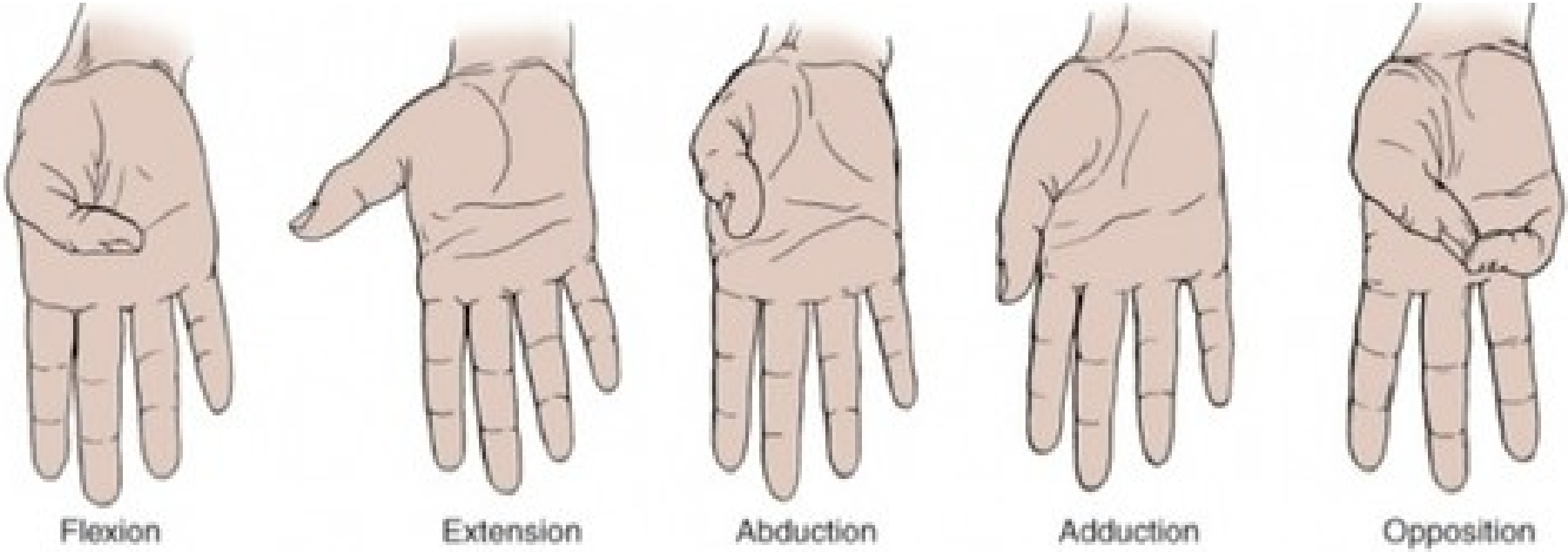

Movements of thumb

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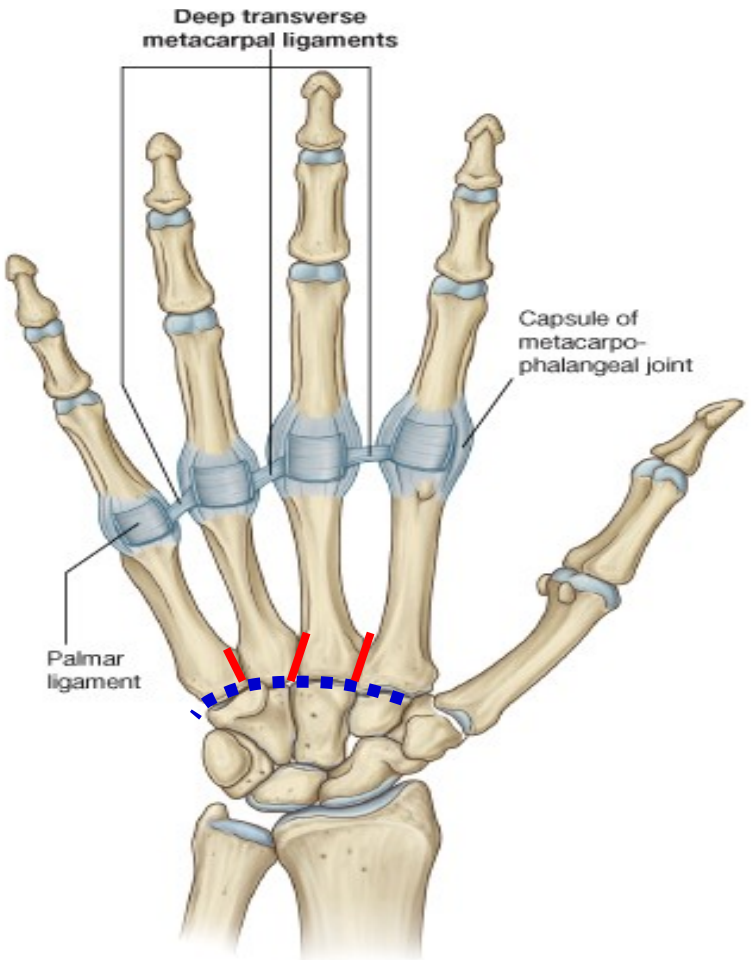
Movements of Thumb	Muscles producing them
Flexion	Flexor pollicis longus & brevis, opponens pollicis
Extension	Extensor pollicis longus & brevis, abductor pollicis longus
Abduction	Abductor pollicis longus & brevis
Adduction	Adductor pollicis
Opposition	Opponens pollicis & flexor

- **Carpometacarpal joints of medial 4 fingers**
- **Type: plane synovial joints**

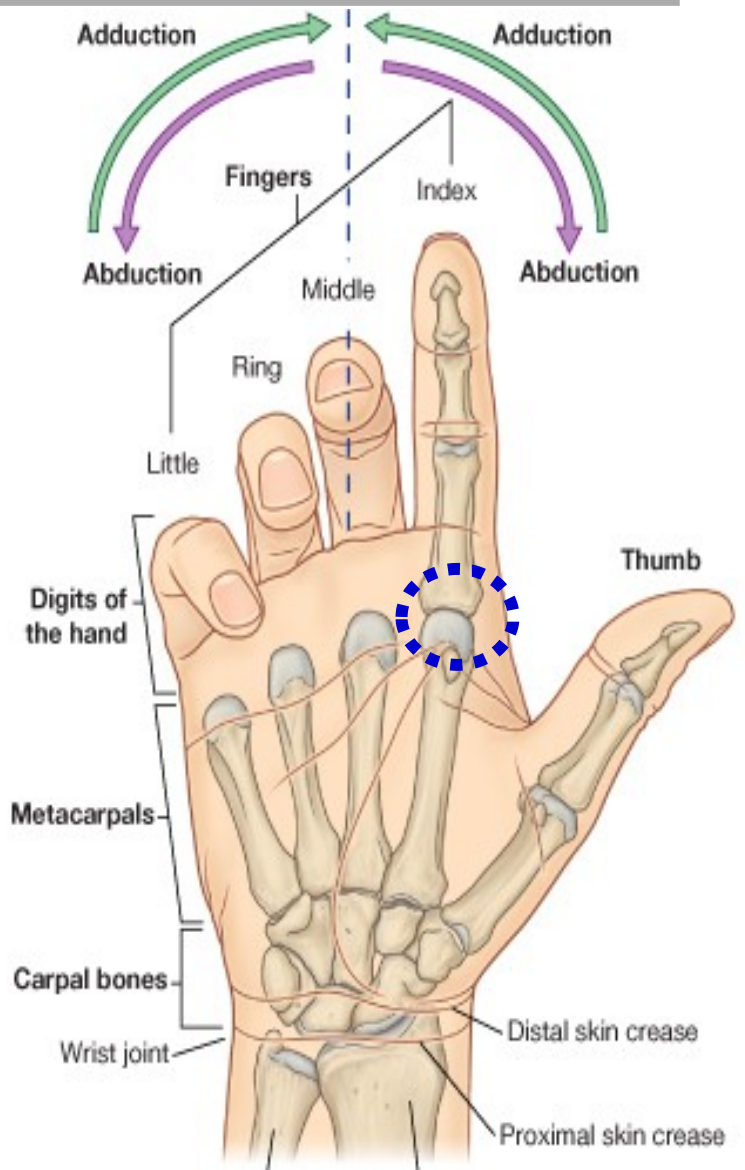
- **Intermetacarpal joints between bases of 2nd, 3rd, 4th,5th metacarpals plane synovial**



https://lh3.googleusercontent.com/m4xWtEu4FHX4P0AY5AE6

Metacarpophalangeal joints

- **Type:**
- **ellipsoid synovial joints**
- **Between heads of metacarpals & proximal phalang**



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- **Movements of metacarpophalangeal joints :**
- **Flexion flexor digitorum superficialis & profundus**
- **Extension extensor digitorum, extensor indicis & ext digiti minimi**
- **Adduction palmar interossei (PAD)**
- **Abduction dorsal interossei (DAP)**

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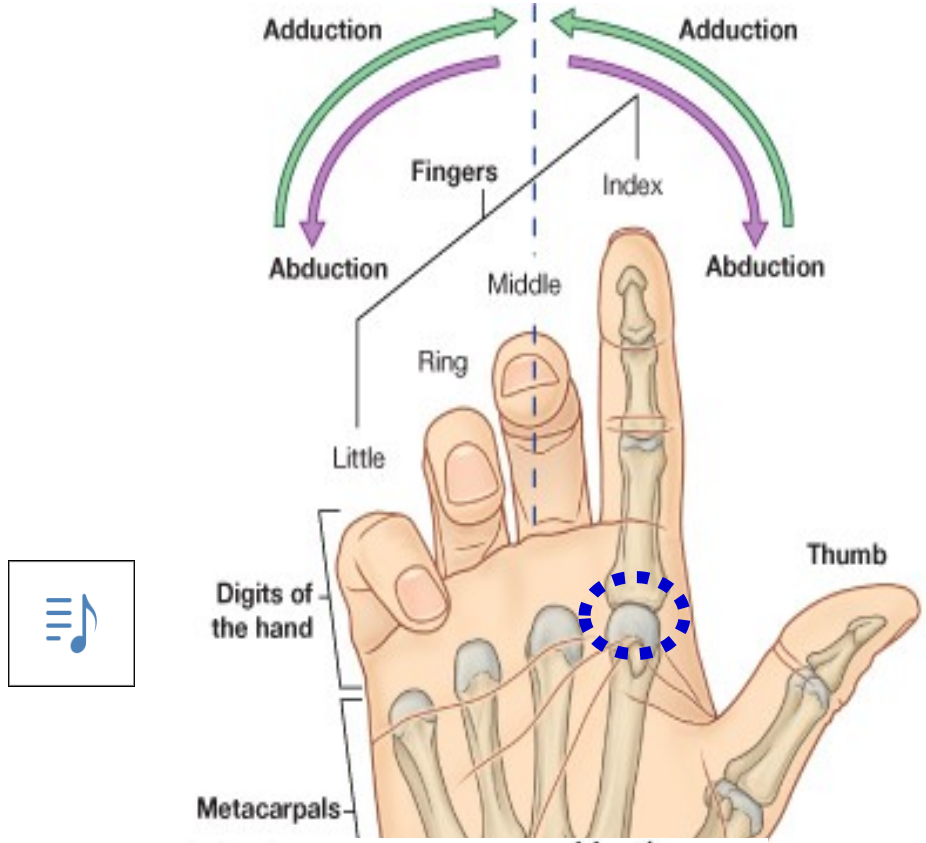
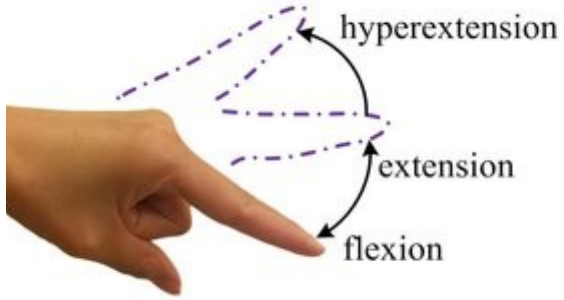
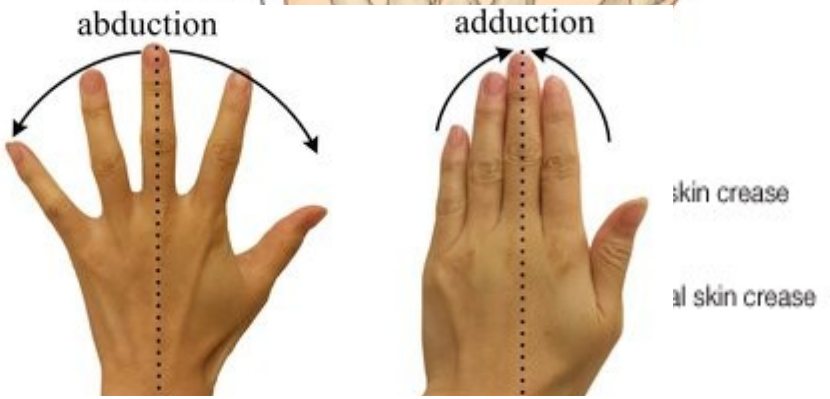
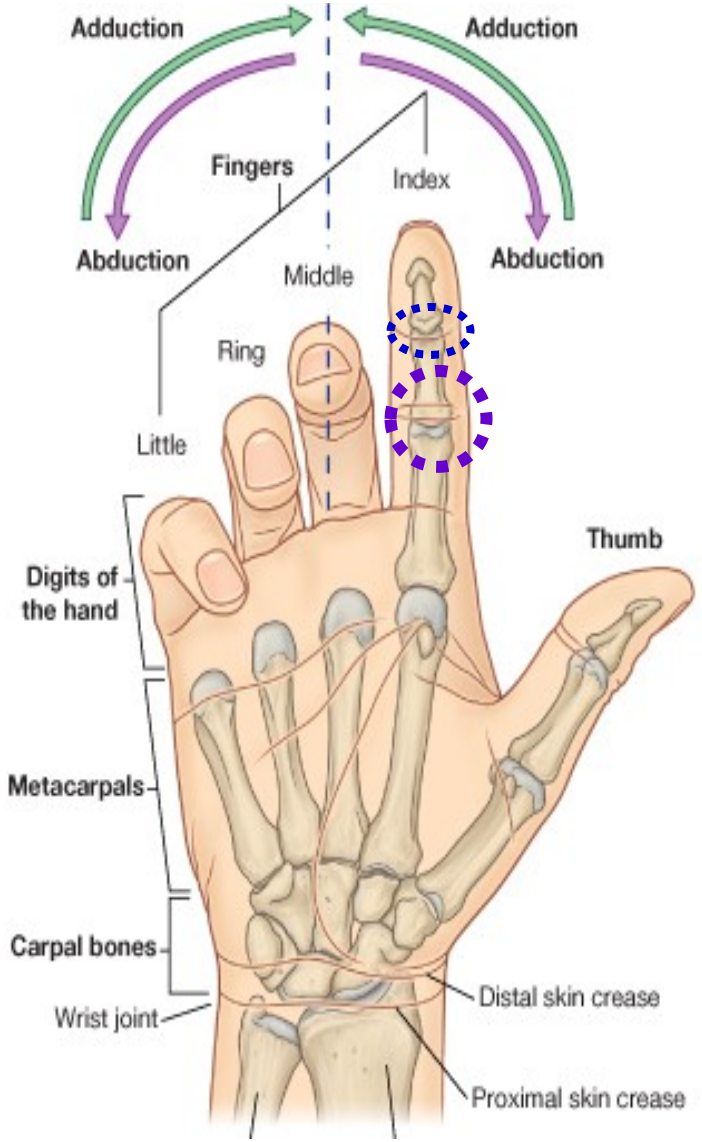






https://lh3.googleusercontent.com/wEA_zLLKE

- **Proximal & distal interphalangeal joints**
- **Type: synovial hinge**
- **Movements:**
- **Flexion FDS & FDP**
- **Extension ext digitorum, ext indicis & ext digiti minimi**



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- **Lumbricals & interossei, put the fingers in the writing position flexion of metacarpo-phalangeal joints & extension of interphalangeal joints**

Extension of Interphalangeal joints

Flexion of metacarpo-phalangeal joint

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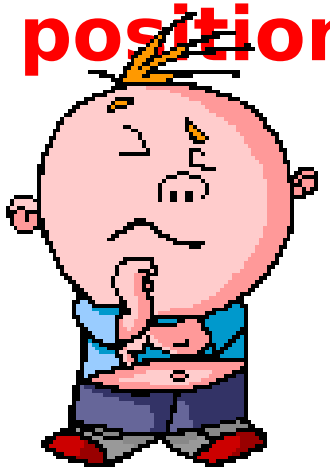
A muscle which can adduct the fingers and :put them in the writing position would be

A. Lumbrical
B. Palmar interosseous
C. Dorsal interosseous
D. Opponens pollicis
E. Pamaris longus



MCQ

:One of the following is a saddle synovial

A. Shoulder joint
B. Wrist joint
C. Elbow joint
D. Interphalangeal joint
E. Sternoclavicular joint

:Suggested Textbook

Clinical Anatomy for Medical Students
Richard S. Snell / Third Edition
Pages 440- 447
517 -506
542 - 540

Thank you